

Hanford Tank Farms Vadose Zone Monitoring Project

Quarterly Summary Report for First Quarter Fiscal Year 2004

February 2004



U.S. Department
of Energy



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Contents

	Page
Signature Page.....	iv
1.0 Introduction	1
2.0 Monitoring Results	2
2.1 A Tank Farm	4
2.2 AX Tank Farm.....	5
2.3 B Tank Farm.....	5
2.4 BX Tank Farm.....	5
2.5 BY Tank Farm.....	5
2.6 C Tank Farm.....	5
2.7 S Tank Farm	5
2.8 SX Tank Farm	6
2.9 T Tank Farm	6
2.10 TX Tank Farm	6
2.11 TY Tank Farm	6
2.12 U Tank Farm	6
3.0 Retrieval Monitoring.....	6
3.1 Tank C-106 Retrieval Monitoring.....	6
3.2 Tank S-112 Retrieval Monitoring	6
3.3 Tank S-102 Retrieval Monitoring	7
4.0 Special Investigations	7
4.1 Tank C-105 Characterization	7
5.0 Operational Issues	7
6.0 Future Monitoring Operations.....	9
7.0 Issues.....	10

List of Tables

Table 2-1. Summary of Routine Monitoring Operations for 1 st Quarter of FY 2004	2
2-2. Summary of Retrieval Monitoring Operations for 1 st Quarter of FY 2004	3
2-3. Summary of NMLS Retrieval Monitoring Operations for 1 st Quarter of FY 2004.....	3
2-4. Summary of Monitored Boreholes Indicating Radionuclide Contaminant Profile Changes.....	4
5-1. Summary of Monitoring Production (Project-to-Date)	8
5-2. Summary of Operational Down Time (Project-to-Date).....	9

Contents (continued)

	Page
References	10
Appendix A. Boreholes Monitored During the First Quarter of FY 2004	A-1
B. Comparison of RAS and SGLS Baseline Measurements of Boreholes Identified in the First Quarter of FY 2004 that Suggest Contaminant Movement	B-1
C. Retrieval Monitoring Log Plots	C-1
D. Boreholes Projected for Monitoring During the Second Quarter of FY 2004	D-1


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1.0 Introduction

The Hanford Tank Farms Vadose Zone Monitoring Project (VZMP) was established in fiscal year (FY) 2001 for comprehensive routine monitoring of existing boreholes in Hanford single-shell tank farms. The primary goal of routine monitoring is to detect changes in gamma activity that may indicate contaminant migration in the vadose zone. In addition to monitoring 250 priority boreholes that have the highest probability of exhibiting contaminant changes, each borehole in all tank farms is expected to be logged at least once during a five-year period. The FY 2004 task is a continuation of the monitoring program initiated in FY 2001 and is in accordance with the *Hanford Tank Farms Vadose Zone Monitoring Project, Baseline Monitoring Plan* (DOE 2003). Stoller provides a supervising logging engineer who is responsible to manage the project and coordinate with the CH2M HILL Hanford Group, Inc. (CH2M HILL) operations personnel in day-to-day monitoring activities. Stoller also provides a geophysicist for analysis, interpretation, and reporting of results. Additional special investigative logging may be required that will utilize the Spectral Gamma Logging System (SGLS), the High Rate Logging System (HRLS), and/or the Neutron Moisture Logging System (NMLS). The HRLS is also used to collect data in boreholes where the contaminant activity exceeds the working range of the RAS instrumentation (greater than about 100,000 picocuries per gram [pCi/g] cesium-137 [¹³⁷Cs]).

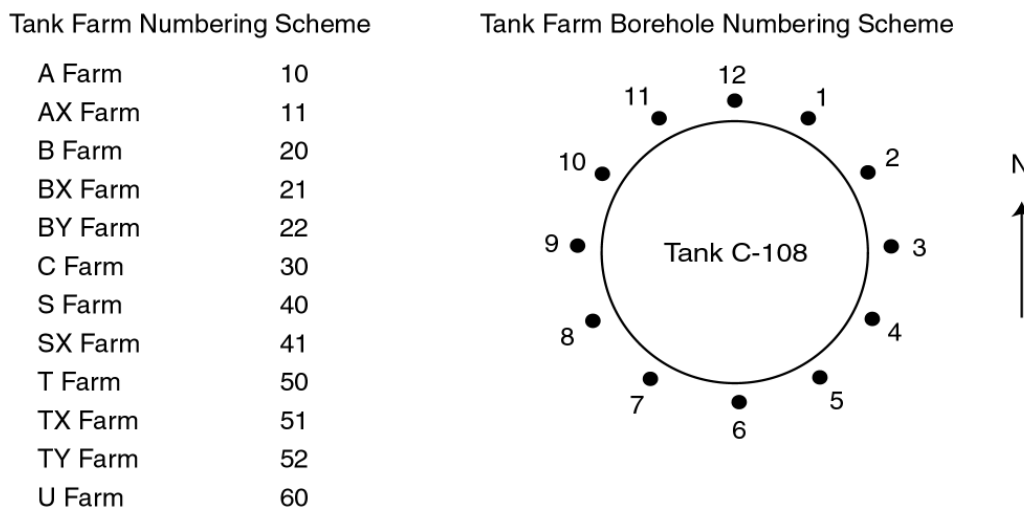
The logging system used for monitoring is the Radionuclide Assessment System (RAS). A baseline record of existing contamination associated with gamma-emitting radionuclides in the vadose zone was established between 1995 and 2000 using the SGLS. Although less precise, the RAS is a simpler, faster, and more cost-effective logging system than the SGLS. Measurements collected with the RAS are compared to the baseline data to assess the long-term stability of the radionuclide contaminant profile. When routine monitoring identifies anomalies relative to the baseline, these anomalies may be investigated using the SGLS, HRLS, and the NMLS.

During FY 2003, monitoring in boreholes associated with individual tanks undergoing retrieval operations was added to the work scope detailed in the original VZMP planning documents. Retrieval monitoring requirements include a pre-retrieval baseline measurement, monthly measurements during the retrieval operations, and monthly measurements for six months after retrieval operations cease. Both RAS and NMLS measurements are required for monthly monitoring, and monthly monitoring is supplemented by manually collected moisture measurements acquired by CH2M HILL personnel over limited depth intervals once or twice per week. During FY 2003, two retrieval projects (tanks C-106 and S-112) were initiated and monitoring has continued into the first quarter of FY 2004. Resources (i.e., RAS) diverted from the routine monitoring to retrieval monitoring has significantly impacted routine monitoring in tank farms. Deployment of the NMLS to support retrieval operations requires an additional logging engineer and reassignment of the system from support for the RI/FS work conducted by the Department of Energy, Richland Operations Office (DOE-RL).

Since FY 2001, routine quarterly reports have been issued to summarize the results of routine monitoring activities, to provide the status of any on-going special investigations, and to provide an updated listing of borehole intervals where monitoring is planned for the next quarter. Retrieval monitoring is an expanded level of effort that requires different strategies for assigning

resources, scheduling, and managing. This quarterly report segregates and summarizes routine and retrieval monitoring activities for the first quarter of FY 2004 and includes project-to-date results where appropriate.

For readers not familiar with the Hanford Tank Farms borehole-numbering scheme, the following illustration shows how to identify the location of a borehole from its identification number:



Boreholes are identified by numbers using the format FF-TT-PP, where "FF" = tank farm, "TT" = tank, and "PP" = the position around the tank in a time-clock numeral from 1 to 12 (12 = north). For example, borehole 30-08-02 is in the C Tank Farm, around tank C-108, and at approximately the 2 o'clock position.

2.0 Monitoring Results

Summaries of monitoring operations from October 1 to December 31, 2003 are included in Tables 2-1 to 2-3.

Table 2-1. Summary of Routine Monitoring Operations for 1st Quarter of FY 2004

Month	October	November	December	Total
RAS Routine Monitoring Events	10	11	1	22
Main Log Footage	557	691	48	1296
Rerun Log Footage	30	10	0	40
Total Footage	587	701	48	1336

Table 2-2. Summary of Retrieval Monitoring Operations for 1st Quarter of FY 2004

Month	October	November	December	Total
RAS Retrieval Monitoring Events	14	9	11	34
Main Log Footage	1530	953	1059	3542
Rerun Log Footage	40	20	30	90
Total Footage	1570	973	1089	3632

Table 2-3. Summary of NMLS Retrieval Monitoring Operations for 1st Quarter of FY 2004

Month	October	November	December	Total
NMLS Retrieval Logging Events	15	8	10	33
Main Log Footage	1657	855	1140	3652
Rerun Log Footage	150	80	100	330
Total Footage	1807	935	1240	3982

Appendix A includes three tables that provide further details of boreholes monitored during the 1st quarter of FY 2004. Table A-1 presents boreholes for routine monitoring, and Table A-2 presents boreholes for retrieval monitoring. Table A-1 is derived from the project's monitoring database, which is continually updated as boreholes are monitored (DOE 2003). Boreholes are selected by a priority score (total score) that emphasizes proximity to tanks with significant drainable liquid remaining and/or the presence of contaminant plumes or where possible contaminant movement is suspected. Where monitoring results suggest possible contaminant movement, the monitoring frequency and monitoring depth intervals may be changed. Consistent with the project requirements of monitoring higher priority boreholes on a relatively frequent basis as well as assuring all boreholes in tank farms are monitored at least once in a five-year period, lower priority boreholes are also selected for monitoring each quarter. This re-prioritization is currently focused on C and S Farms, which are anticipated to be among the first tank farms considered for closure. On the basis of the FY 2003 rate of logging, approximately 110 RAS logging events are expected for routine monitoring each quarter.

Tables A-2 and A-3 present the boreholes monitored for retrieval purposes during the first quarter of FY 2004. The strategy for retrieval monitoring is to log boreholes around a tank before retrieval, once per month during retrieval, and once per month for 6 months after retrieval is complete. Both the RAS and NMLS are used in each retrieval monitoring borehole each month. Monitoring frequencies do not change unless anomalous conditions are observed. Each RAS retrieval monitoring event results in approximately one less routine monitoring event. Each NMLS monitoring event requires an additional logging system to be re-deployed from the DOE-RL baseline characterization project and reassignment of the supervising logging engineer from routine monitoring to the retrieval project. One retrieval project was assumed for FY 2004 planning purposes to determine the necessary resources. However, during the first quarter, two retrieval monitoring projects were being conducted concurrently and the routine monitoring project is falling behind planned goals. Approximately 60% of the total monitoring events were for retrieval monitoring. It is projected that three retrieval projects will be ongoing in the second quarter and possibly four during the third quarter. Therefore, given current resources, the routine monitoring project will continue to be adversely impacted.

A total of 56 monitoring events were performed during the first Quarter of FY 2004 (22 routine and 34 retrieval). The following sections describe the routine monitoring performed in each tank farm. In the interest of brevity, plots for boreholes where no apparent change was observed are not included in this report. These logs are available on request. Table 2-3 lists all the boreholes that have indicated potential changes in radionuclide contaminant profile since the inception of the monitoring project in June 2001. Plots for the respective boreholes are included in the referenced quarterly or fiscal year reports.

Table 2-4. Summary of Monitored Boreholes Indicating Radionuclide Contaminant Profile Changes

Tank Farm	Borehole Number	Radio-nuclide	Deter-mined	Number of Events	Assessment	Assigned Frequency	Qtrly/Annual Report
BX	21-12-02	^{60}Co	9/23/03	3	Possible decrease	6 mos.	FY 2003
BX	21-27-08	$^{238}\text{U}/^{235}\text{U}$	03/13/02	5	Not confirmed	6 mos.	2 nd 2002
BY	22-03-04	^{60}Co	11/15/01	3	Not confirmed	6 mos.	1 st 2002
BY	22-07-02	^{60}Co	11/29/01	3	Not confirmed	6 mos.	1 st 2002
BY	22-07-05	^{60}Co	12/12/01	3	Not confirmed	6 mos.	1 st 2002
BY	22-08-05	^{60}Co	03/30/99	4	Not confirmed	6 mos.	1 st 2002
C	30-06-10	^{60}Co	03/03/97	5	Possible increase	1 mos.	3 rd 2002
C	30-08-02	^{60}Co	09/11/02	5	Definite increase	3 mos.	FY 2002
C	30-08-03	?	1/21/03	2	Not confirmed	3 mos.	FY 2003
S	40-02-03	^{137}Cs	7/9/03	1	Not confirmed	6 mos.	FY 2003
SX	41-02-02	$^{137}\text{Cs}/^{90}\text{Sr}$	09/07/01	5	Not confirmed	6 mos.	FY 2001
SX	41-10-01	^{137}Cs	2/11/03	4	Possible increase	6 mos.	FY 2003
SX	41-15-07	^{137}Cs	2/12/03	2	Not confirmed	6 mos.	FY 2003
T	50-01-09	^{60}Co	07/30/01	5	Not confirmed	6 mos.	FY 2001
T	50-02-05	^{137}Cs	5/19/03	4	Not confirmed	6 mos.	FY 2003
T	50-06-02	$^{60}\text{Co}/^{154}\text{Eu}$	07/18/01	5	Not confirmed	6 mos.	FY 2001
T	50-06-03	^{60}Co	07/18/01	5	Not confirmed	6 mos.	FY 2001
T	50-06-18	^{60}Co	09/03/02	5	Possible increase	3 mos.	FY 2002
T	50-04-10	^{60}Co	01/28/02	5	Poss. confirmation	3 mos.	2 nd 2002
T	50-09-01	$^{60}\text{Co}/^{154}\text{Eu}$	07/23/01	5	Not confirmed	6 mos.	FY 2001
T	50-09-02	^{60}Co	01/08/02	3	Not confirmed	12 mos.	2 nd 2002
T	50-09-10	$^{60}\text{Co}/^{154}\text{Eu}$	07/23/01	5	Not confirmed	6 mos.	FY 2001
TX	51-03-11	^{60}Co	05/20/02	2	Possible increase	6 mos.	3 rd 2002
TY	52-03-06	^{137}Cs	05/02/02	5	Definite change	3 mos.	3 rd 2002
TY	52-06-05	^{60}Co	05/14/02	3	Possible increase	3 mos.	3 rd 2002
TY	52-06-07	^{60}Co	5/22/03	2	Not confirmed	12 mos.	FY 2003
U	60-04-08	$^{238}\text{U}/^{235}\text{U}$	07/16/01	8	Not confirmed	6 mos.	FY 2001
U	60-05-05	$^{238}\text{U}/^{235}\text{U}$	08/27/02	5	Possible increase	6 mos.	FY 2002
U	60-07-01	$^{238}\text{U}/^{235}\text{U}$	07/12/01	8	Not confirmed	6 mos.	FY 2001

2.1 A Tank Farm

Routine monitoring was not performed in A Farm during the 1st quarter of FY 2004.

2.2 AX Tank Farm

Routine monitoring was not performed in AX Farm during the 1st quarter of FY 2004.

2.3 B Tank Farm

Routine monitoring was not performed in B Farm during the 1st quarter of FY 2004.

2.4 BX Tank Farm

A total of 5 boreholes located around tanks BX-103, -104, -107, and -110 were monitored during the 1st quarter of FY 2004. None of these boreholes showed any evidence of contaminant movement.

2.5 BY Tank Farm

A total of 10 boreholes located around tanks BY-103, -105, and -106 were monitored during the 1st quarter FY 2004. Borehole 22-03-04 had shown a possible increase in ⁶⁰Co concentrations between 77 and 82 ft during the initial monitoring event on 11/15/01. The three subsequent monitoring events have not shown any additional changes.

2.6 C Tank Farm

A total of 13 boreholes located around tanks C-104, -105, -106, -108, and -109 were monitored during the 1st quarter of FY 2004. Eight of these boreholes associated with tank C-106 were monitored on a monthly basis in support of the C-106 Waste Retrieval Project. These boreholes were also logged on a monthly basis with the NMLS. This work is discussed in detail in Section 3.1, "Tank C-106 Retrieval Monitoring".

A possible increase of ⁶⁰Co was identified in borehole 30-06-10 between 124 and 126 ft on 4/23/02. Subsequent monitoring events have not shown any additional changes. A definite change in ⁶⁰Co concentrations was discovered in borehole 30-08-02 on 9/11/02 between 50 and 61 ft. Subsequent monitoring events continue to show downward movement of ⁶⁰Co through this interval (Appendix B).

2.7 S Tank Farm

A total of 10 boreholes located around tanks S-105, -109, -111, and -112 were monitored during the 1st quarter of FY 2004. Eight of these boreholes associated with tank S-112 were monitored on a monthly basis in support of the S-112 Waste Retrieval Project. These boreholes were also logged on a monthly basis with the NMLS. This work is discussed in detail in Section 3.2, "Tank S-112 Retrieval Monitoring". None of these boreholes showed any evidence of contaminant movement.

2.8 SX Tank Farm

Routine monitoring was not performed in SX Farm during the 1st quarter of FY 2004.

2.9 T Tank Farm

Routine monitoring was not performed in T Farm during the 1st quarter of FY 2004.

2.10 TX Tank Farm

Routine monitoring was not performed in TX Farm during the 1st quarter of FY 2004.

2.11 TY Tank Farm

Routine monitoring was not performed in TY Farm during the 1st quarter of FY 2004.

2.12 U Tank Farm

Routine monitoring was not performed in U Farm during the 1st quarter of FY 2004.

3.0 Retrieval Monitoring

3.1 Tank C-106 Retrieval Monitoring

RAS retrieval monitoring and NMLS moisture logging continued on a monthly basis for eight boreholes surrounding the tank through the 1st quarter of FY 2004. Slight moisture increases were observed in many of these boreholes at depths below the bottom of the tank (Appendix C). However, the RAS measurements did not indicate any increase in gamma activity in these boreholes. Baseline moisture measurements were also acquired in boreholes 30-09-06, -07, and 30-08-02, northeast of tank C-106, to determine if a moisture influx was invading the area from this direction where borehole 30-08-02 has shown changes in the ⁶⁰Co contaminant profile in the past (Appendix C). Additional measurements will be acquired in these boreholes during the next retrieval monitoring event scheduled for January. Currently, no explanation for the slight moisture increases has been determined. Moisture increases may be the result of natural seasonal fluctuations rather than a tank leak. Retrieval activities associated with this tank are projected to be completed during the 2nd quarter of FY 2004. The monthly measurements will continue for six months after the end of retrieval.

3.2 Tank S-112 Retrieval Monitoring

RAS retrieval monitoring and NMLS moisture logging continued on a monthly basis in eight boreholes through the 1st quarter of FY 2004. Possible moisture increases are observed between

25 and 50 ft in some boreholes (Appendix C). No significant increases in gamma activity were observed during this time. Monthly measurements will continue to be collected up to six months after retrieval activities have ceased.

3.3 Tank S-102 Retrieval Monitoring

In anticipation of future tank S-102 (S Farm) retrieval activities, all boreholes surrounding this tank have been assigned a monthly monitoring frequency during the 2nd quarter of FY 2004. A baseline RAS monitoring event was completed in July 2003. Monthly moisture logging with the NMLS will begin during the 2nd quarter of FY 2004. It is also suggested that one of these boreholes (40-02-03) be logged with the HRLS to assess any potential changes in a zone of high gamma flux. This borehole should also be logged prior to the start of retrieval with the SGLS to assess a potential increase in gamma activity (^{137}Cs) between 44 and 47 ft identified during the initial RAS monitoring event on 7/8/03.

4.0 Special Investigations

4.1 Tank C-105 Characterization

No work was performed during the 1st quarter of FY 2004 in support of the Tank C-105 Characterization Project. Drilling is expected to begin during the 2nd quarter of FY 2004. The new borehole will be logged with both the SGLS and NMLS logging systems.

5.0 Operational Issues

During the first quarter of FY 2004, an average of approximately 1.0 borehole was monitored per working day (0.4 and 0.6 for the routine and retrieval monitoring, respectively). This rate incorporates all operational aspects of monitoring, including both scheduled and unscheduled down time for maintenance, operator support, security, etc.

The routine and retrieval monitoring project experienced 27.4 days of down time during the first quarter of FY 2004. The majority of this down time was due to the lack of dedicated operator support. The RAS project has lower priority than other Tank Farms projects; therefore, when resources are required on higher priority tasks the RAS operators are diverted to these other tasks. When operators are available, they are generally assigned to support the RAS retrieval effort or the CH2M HILL handheld moisture measurements. Thus, the RAS routine monitoring is often not supported. The RAS is currently assigned approximately 60% of the time in support of retrieval projects.

Tables 5-1 and 5-2 include summaries of production and operational issues, respectively, that affect monitoring production.

Table 5-1. Summary of Monitoring Production (Project-to-Date)

Quarter	Total Work Days	Total Days Down	Total Monitoring Events	Boreholes Monitored per Day
4 th of FY01	56	29.3	84	1.5
1 st of FY02	56	35.2	54	1.0
2 nd of FY02	55	34.1	74	1.3
3 rd of FY02	59	21.1	113	1.9
4 th of FY02	66	27.6	144	2.2
1 st of FY03	56	34.7	72	1.3
2 nd of FY03	55	22.5	97	1.8
3 rd of FY03	58	25.0	105	1.8
4 th of FY03	63	22.6	103	1.6
1 st of FY04	56	27.4	56	1.0
Cumulative Total	580	279.5	902	1.6
Average/Quarter	58.0	28.0	90.2	1.6

Table 5-2. Summary of Operational Down Time

Quarter	Equipment/ Truck Problems/Calibration (hrs)	No HPT/ Operator Support (hrs)	Security Measures (hrs)	No Charge Code or Administrative (hrs)	Moving Truck (hrs)	Weather (hrs)	Misc. (hrs)	Total Down Time (hrs)
4 th of FY01	64	130	20	27	20	3	0	264
1 st of FY02	107	84	51	44	14	13	4	317
2 nd of FY02	143	40	24	58	9	18	15	307
3 rd of FY02	31	62	0	36	27	8	26	190
4 th of FY02	81	122	0	0	37	0	8	248
1 st of FY03	71	107	0	18	18	0	98	312
2 nd of FY03	62	126	0	0	10	0	0	198
3 rd of FY03	51	149	0	0	12	0	13	225
4 th of FY03	45	136	0	0	16	6	0	203
1 st of FY03	6	198	0	0	12	22	9	247
Cumulative Total	661	1154	95	183	175	70	173	2511
Average/Quarter	66.1	115.4	9.5	18.3	17.5	7.0	17.3	251.1

6.0 Future Monitoring Operations

Appendix D provides a summary by tank farm of boreholes scheduled for monitoring through the end of the second quarter of FY 2004. On the basis of two boreholes per day, Table D-1 includes 110 routine monitoring boreholes that could be logged with sufficient operator support and equipment. Appendix Tables D-2 and D-3 include 24 boreholes associated with the three ongoing waste retrieval projects. These boreholes are being monitored on a monthly basis and will account for 72 monitoring events during the second quarter of FY 2004; 72 NMLS monitoring events will also occur concurrent with the RAS retrieval events. Because the retrieval monitoring takes precedence over the routine monitoring, only 38 routine monitoring events may occur. If downtime does not improve over prior quarters, it is likely that few routine monitoring boreholes will be logged.

7.0 Issues

A viable monitoring program is an important tool in demonstrating the long-term stability of subsurface contaminant plumes and to identify areas in which contaminant migration is occurring. This information is important for input into contaminant transport models that will be used for risk assessment to close tank farms. Monitoring data also provide a basis from which the long-term stability of vadose zone contaminant plumes can be demonstrated. This allows consideration of no further action and/or monitored natural attenuation as a credible remedial alternative.

Furthermore, monitoring of existing drywells before, during, and after retrieval operations is an important component of the overall leak detection process. The current monitoring (routine and retrieval) projects are based on the deployment of a single RAS. It is necessary to provide additional monitoring systems as the scope of the waste retrieval program increases and the routine monitoring is not being accomplished as planned.

References

U.S. Department of Energy (DOE), 2003. *Hanford Tank Farms Vadose Zone Monitoring Project, Baseline Monitoring Plan*, GJO-HGLP 1.8.1, Revision 0, Grand Junction Office, Grand Junction, Colorado.

Appendix A
Boreholes Monitored During the 1st Quarter of FY 2004

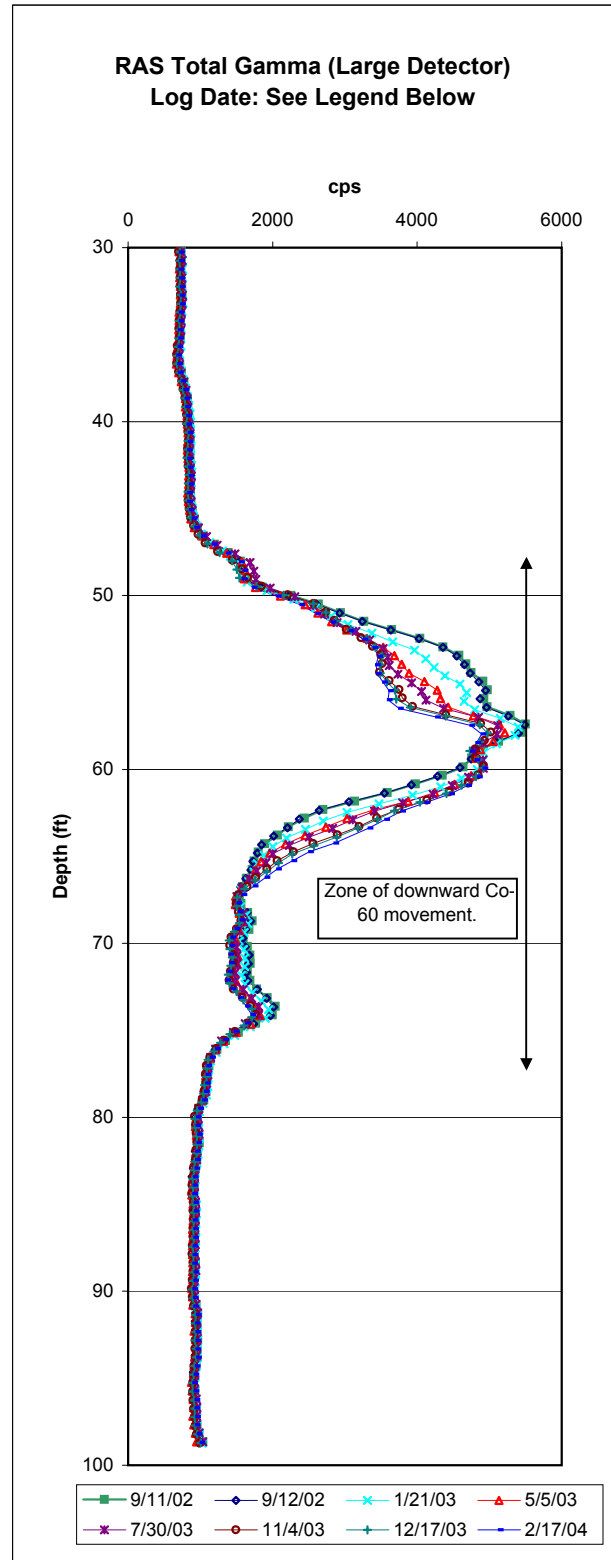
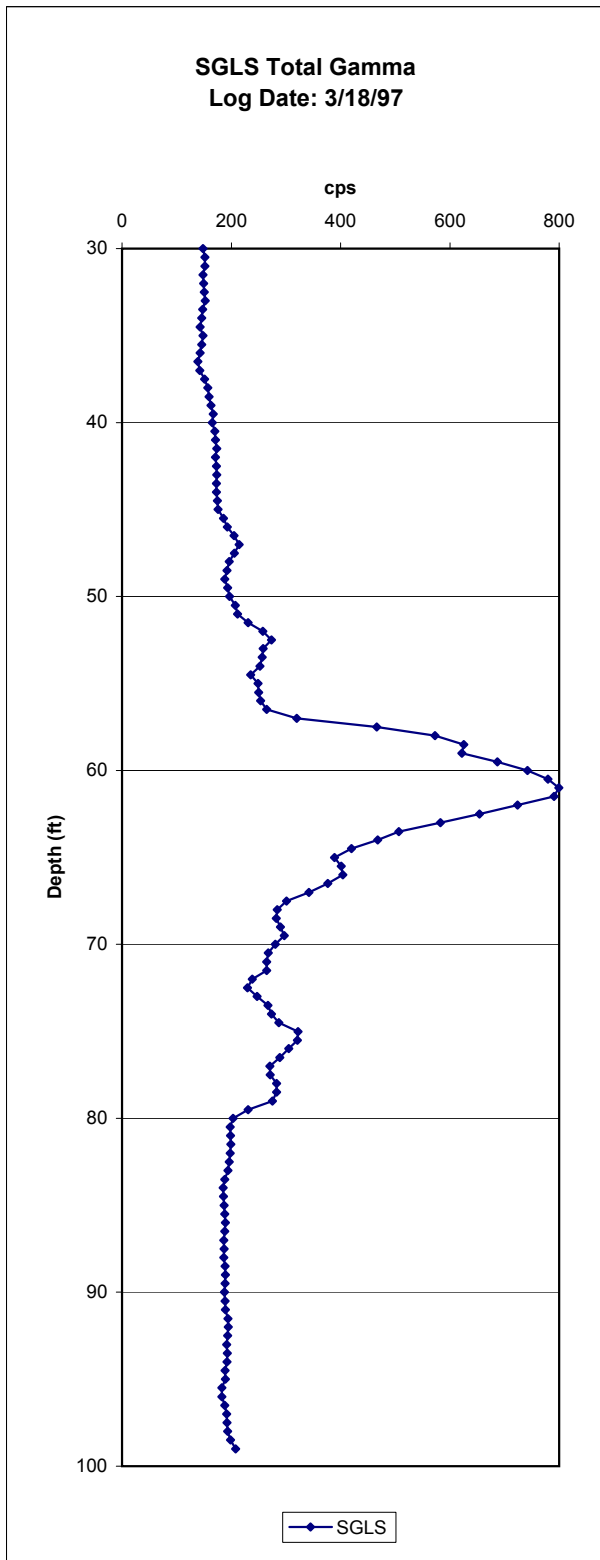
Table A-2. Retrieval Boreholes Monitored During the 1st Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Next Event	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	Ras Event G	Total 1st Qrt. Events	Total Events (to date)	Comment	
30-00-01	C-106	0	65	65		01/01/04	04/24/02	01/16/03	04/28/03	07/22/03	09/15/03	11/03/03	12/02/03	2	7	No apparent change, C-106 Retrieval	
30-05-02	C-105	5	127	122	20	01/14/04	04/22/02	01/29/03	04/29/03	07/23/03	09/17/03	10/23/03	12/15/03	2	7	No apparent change, C-106 Retrieval	
30-06-02	C-106	0	122	122		11/20/03	01/27/03	04/28/03	07/21/03	09/16/03	10/21/03			1	5	No apparent change, C-106 Retrieval	
30-06-03	C-106	0	98	98		01/01/04	01/23/03	04/28/03	07/21/03	09/16/03	10/22/03	12/02/03		2	6	No apparent change, C-106 Retrieval	
30-06-04	C-106	0	129	129		01/21/04	09/11/02	01/27/03	04/29/03	07/23/03	09/17/03	10/31/03	12/22/03	2	7	No apparent change, C-106 Retrieval	
30-06-09	C-106	5	98	93	20	01/11/04	04/22/02	01/22/03	04/22/03	07/22/03	09/10/03	10/23/03	12/12/03	2	7	No apparent change, C-106 Retrieval	
30-06-10	C-106	0	128	128		01/21/04	04/23/02	01/23/03	04/22/03	07/22/03	09/08/03	11/03/03	12/22/03	2	7	Pos. change 124-126 ft Co-60, C-106 Retrieval	
30-06-12	C-106	0	98	98		01/07/04	04/24/02	01/24/03	04/29/03	07/22/03	09/11/03	10/22/03	12/08/03	2	7	No apparent change, C-106 Retrieval	
30-08-02	C-108	30	99	69	10	01/16/04	09/12/02	01/21/03	05/05/03	07/30/03	11/04/03	12/17/03		1	7	Def. change in Co-60 49-75 ft, down movement	
30-09-06	C-109	30	98	68		01/11/04	01/29/03	05/05/03	07/30/03	10/31/03	12/12/03			1	6	No apparent change	
30-09-07	C-109	30	121	91		01/14/04	01/16/03	05/02/03	07/30/03	10/29/03	12/15/03			1	6	No apparent change	
40-09-06	S-109	0	98	98		12/24/03	06/05/02	03/11/03	08/27/03	10/15/03	11/24/03			2	5	No apparent change; S-112 Retrieval	
40-11-08	S-111	0	97	97	10	12/25/03	06/03/02	10/17/03	11/25/03					2	3	No apparent change, S-112 Retrieval	
40-11-09	S-111	0	98	98	10	12/31/03	06/05/02	06/18/03	10/16/03	12/01/03				2	4	No apparent change, S-112 Retrieval	
40-12-02	S-112	0	99	99		12/24/03	06/05/02	03/12/03	08/27/03	10/16/03	11/24/03			2	5	No apparent change; S-112 Retrieval	
40-12-04	S-112	0	126	126		12/25/03	06/04/02	03/10/03	08/22/03	10/09/03	11/25/03			2	5	No apparent change; S-112 Retrieval	
40-12-06	S-112	0	144	144	20	12/19/03	06/04/02	03/10/03	08/21/03	10/14/03	11/19/03			2	5	No apparent change; S-112 Retrieval	
40-12-07	S-112	0	98	98		12/19/03	06/04/02	03/11/03	08/26/03	10/08/03	11/19/03			2	5	No apparent change; S-112 Retrieval	
40-12-09	S-112	0	98	98		12/17/03	06/05/02	03/11/03	08/27/03	10/14/03	11/17/03			2	5	No apparent change; S-112 Retrieval	
									Total Retrieval Monitoring Events This Quarter =						34		

Appendix B
Comparison of RAS and
SGLS Baseline Measurements of
Boreholes Identified in the 1st Quarter of
FY 2004 That Suggest Contaminant
Movement

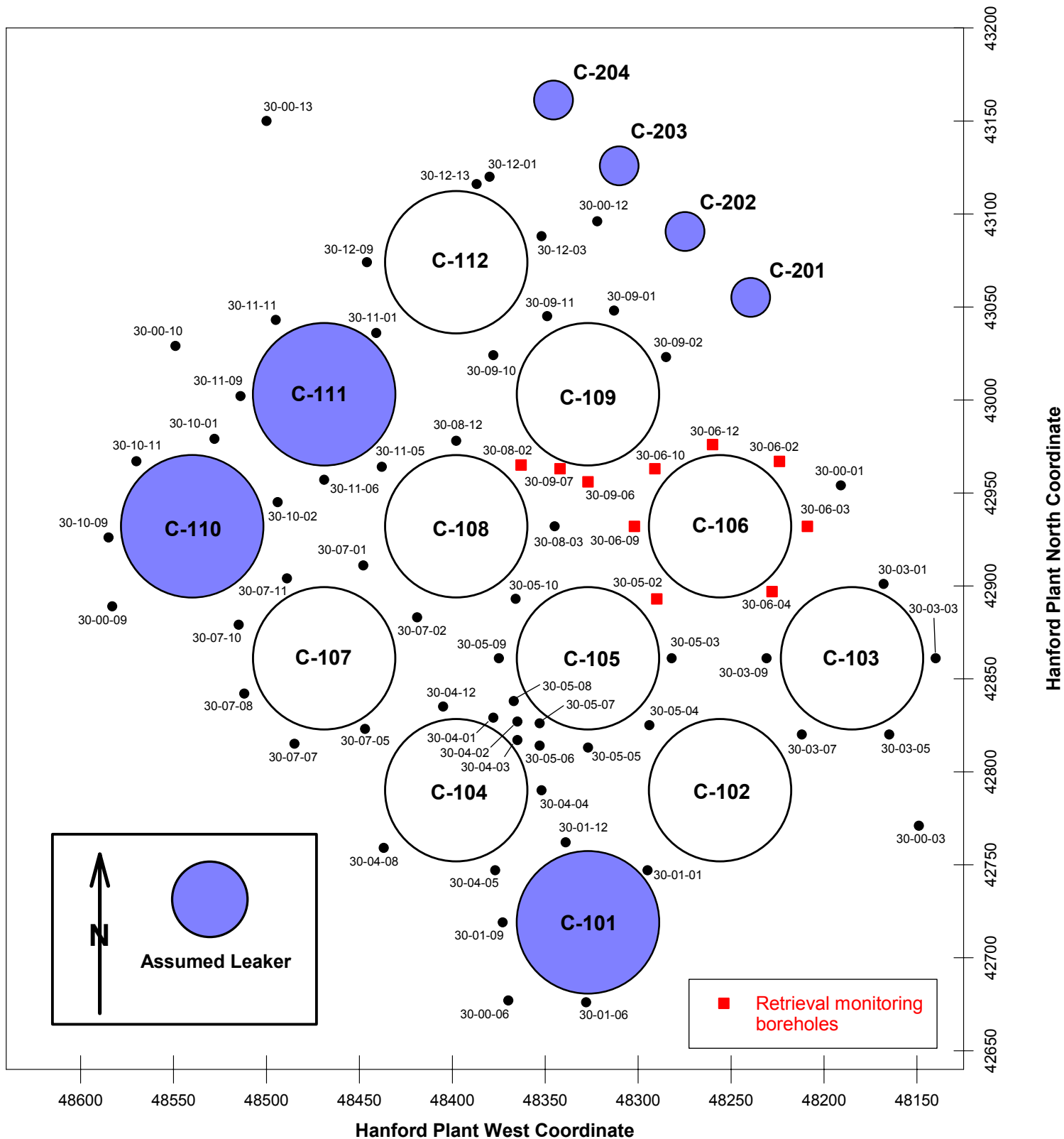
[illegible]

Borehole 30-08-02



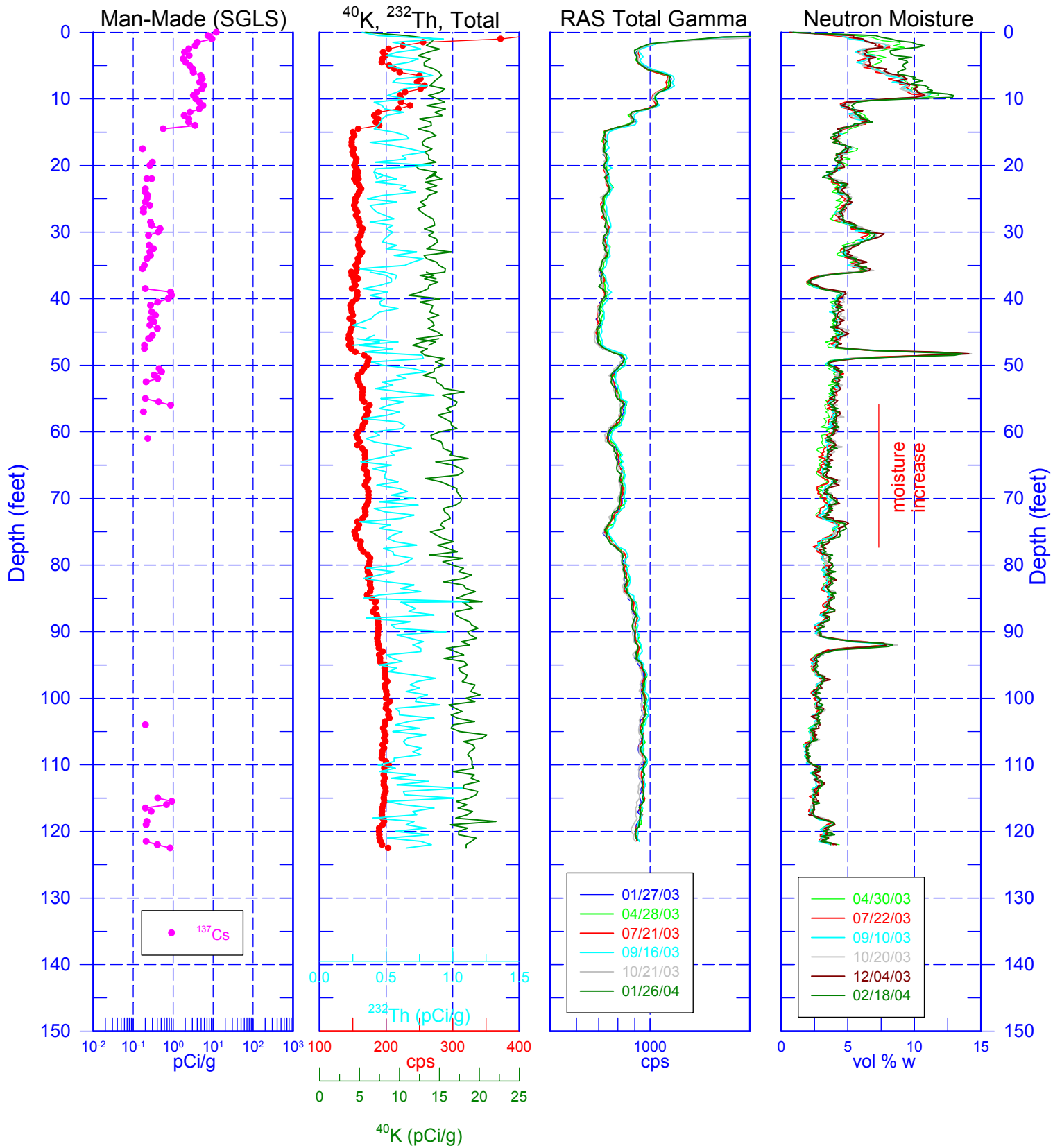
Appendix C

Retrieval Monitoring Log Plots



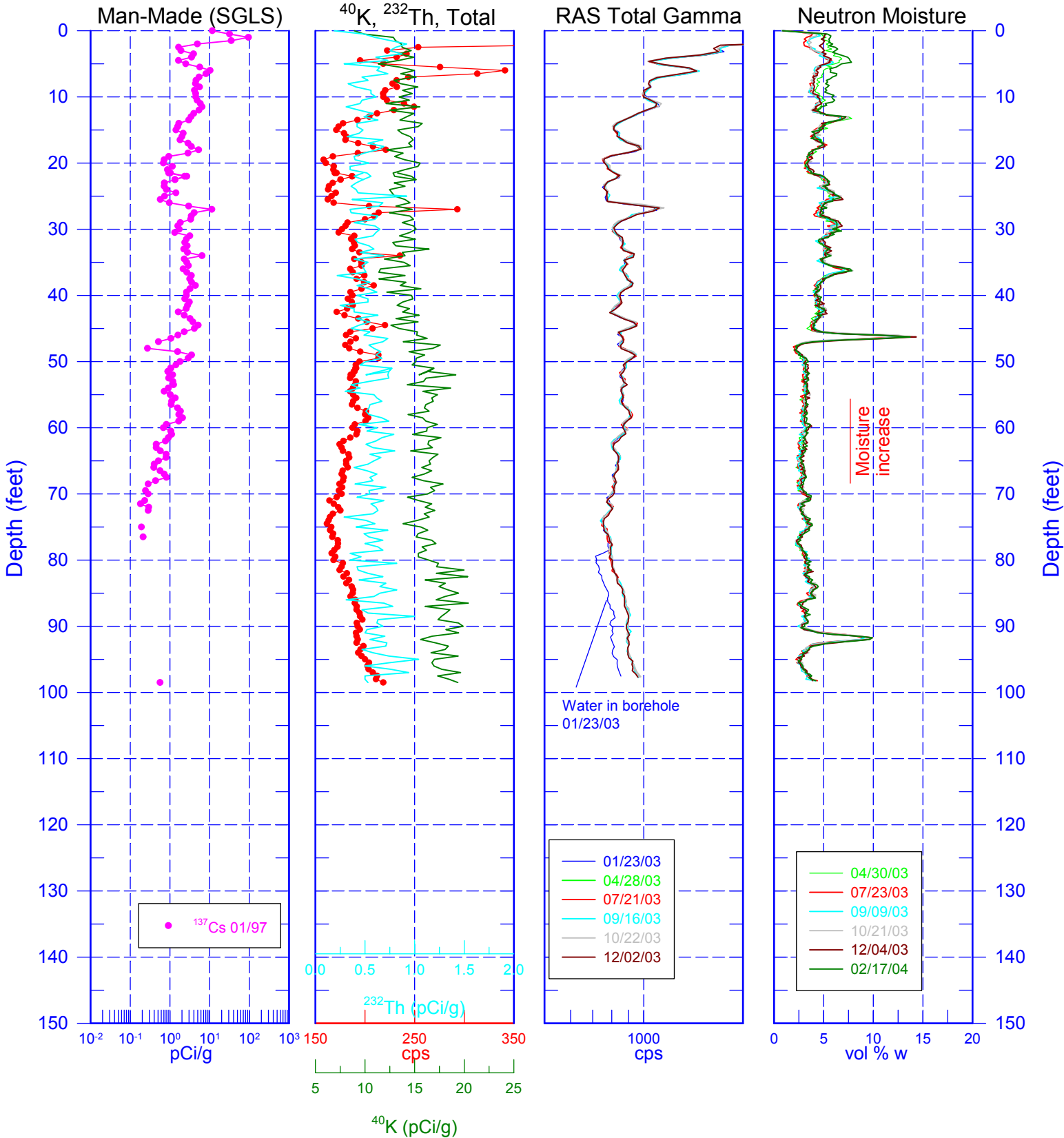
Tank C-106

30-06-02



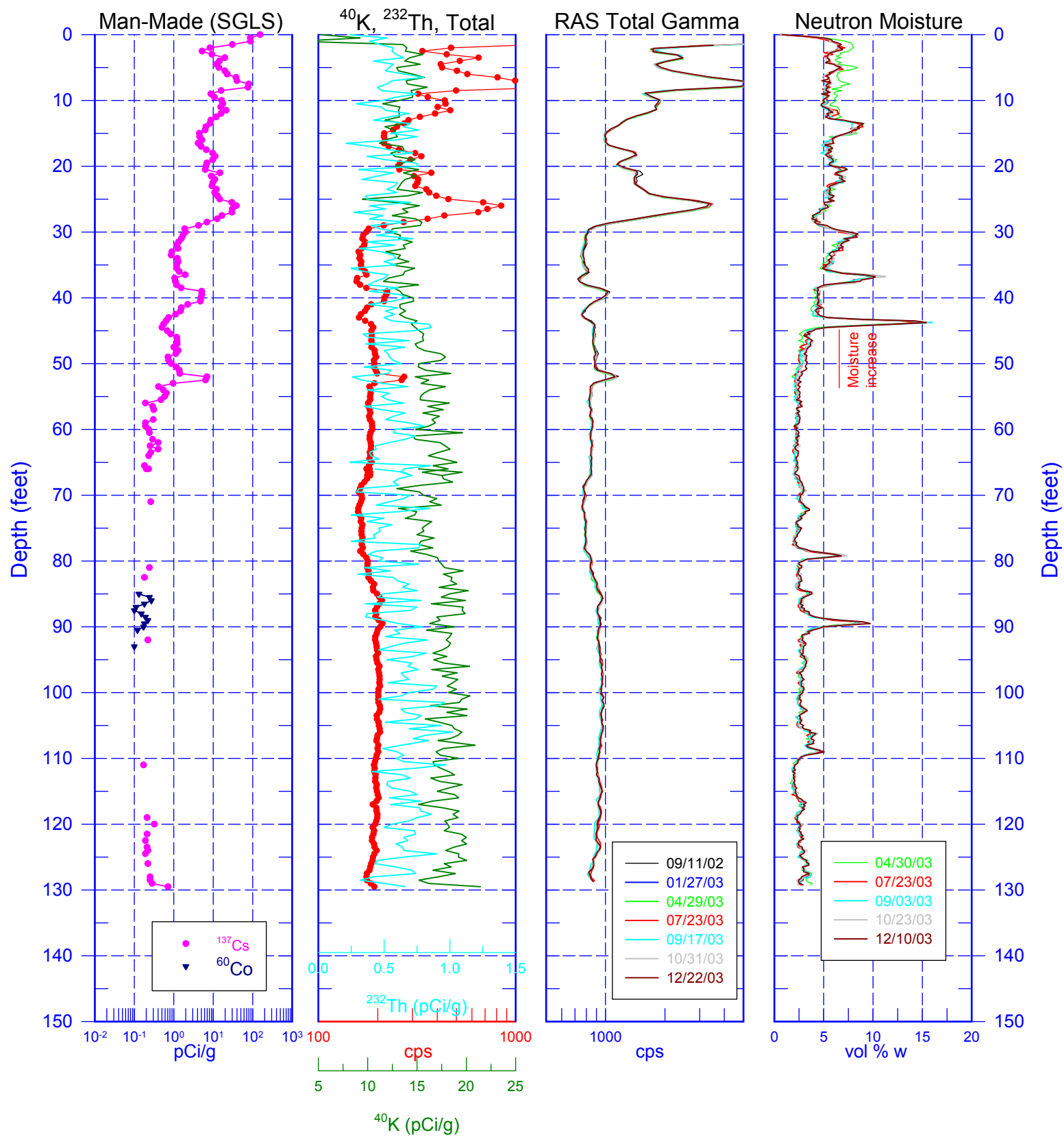
Tank C-106

30-06-03



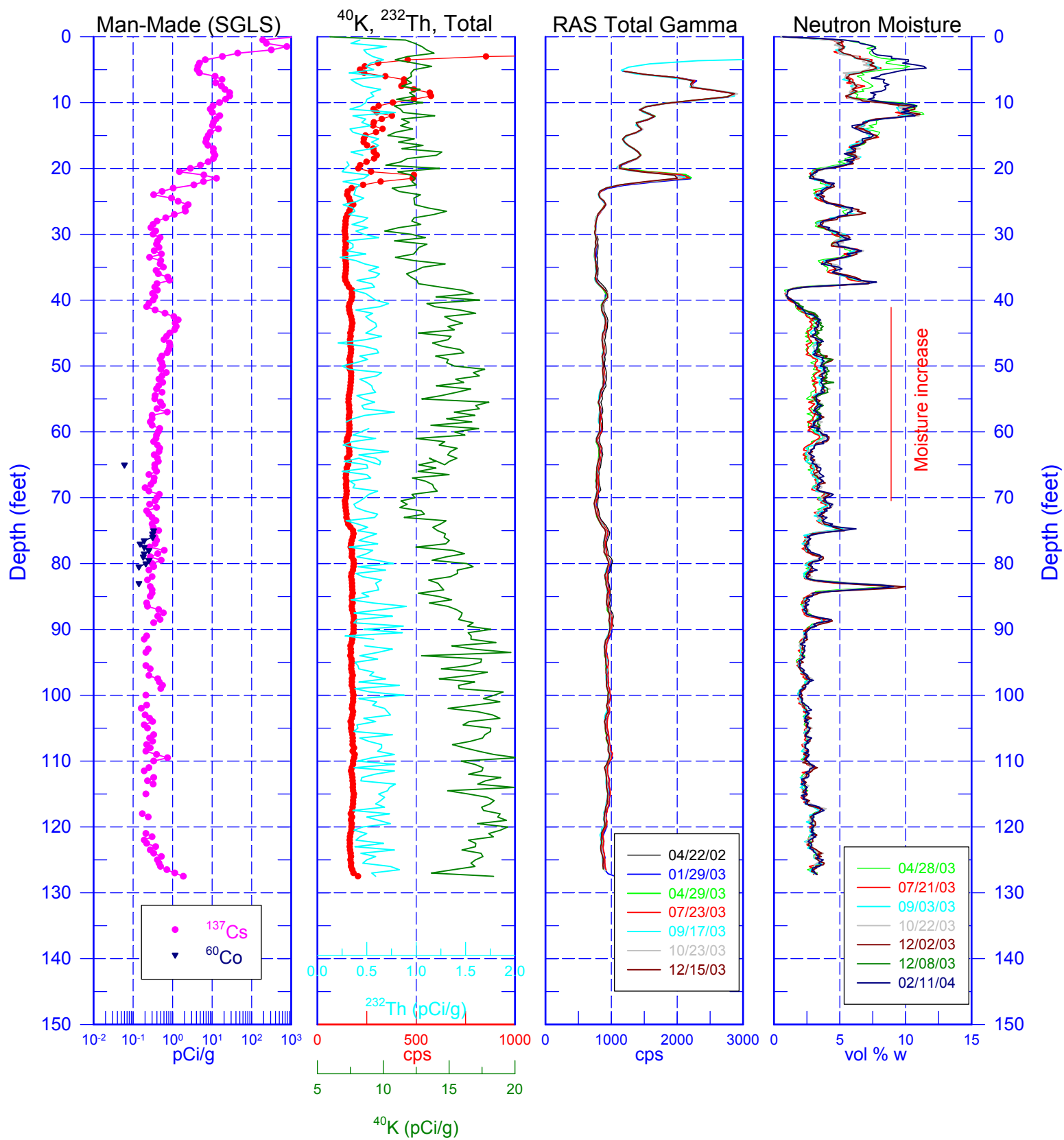
Tank C-106

30-06-04



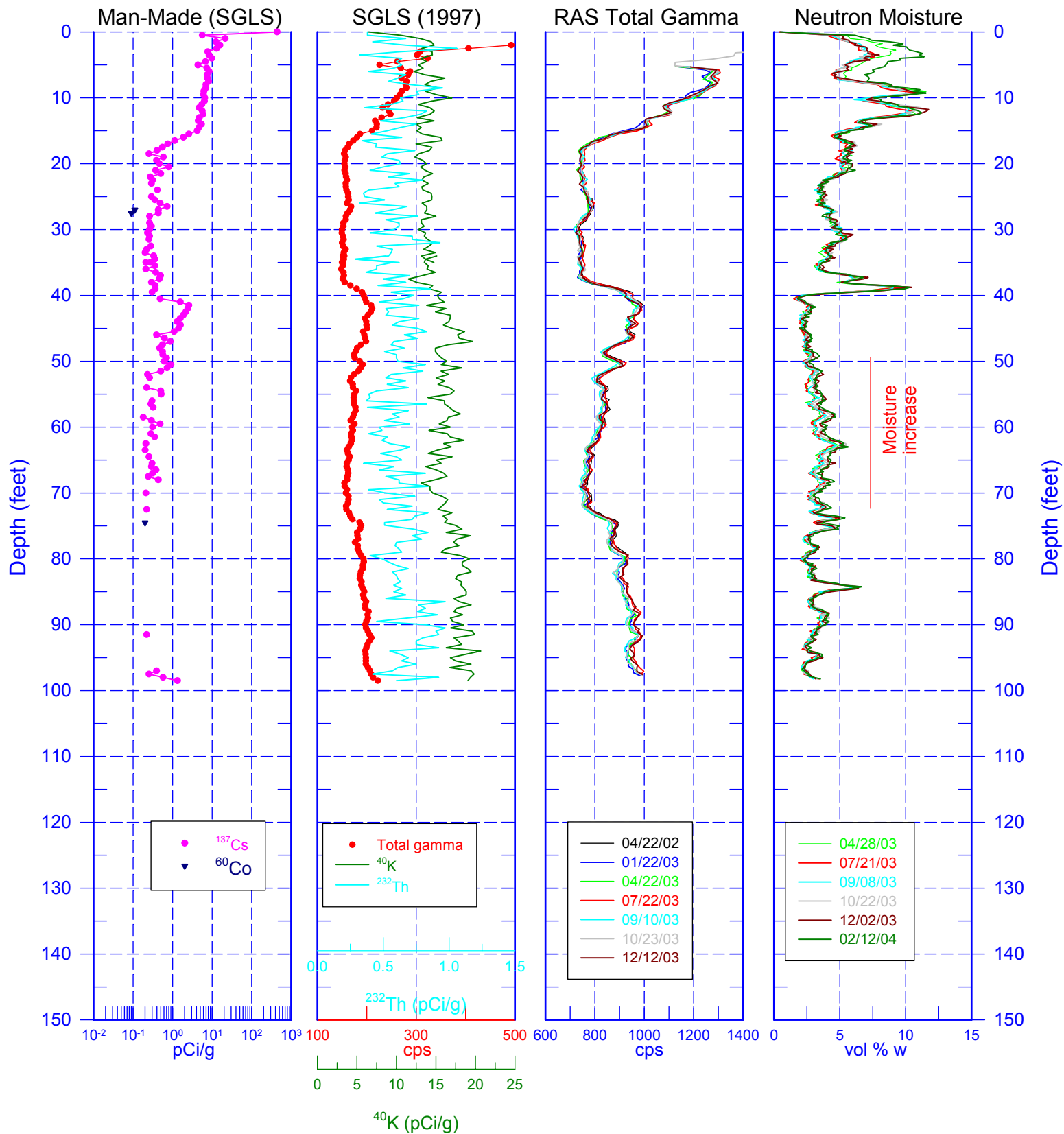
Tank C-105

30-05-02



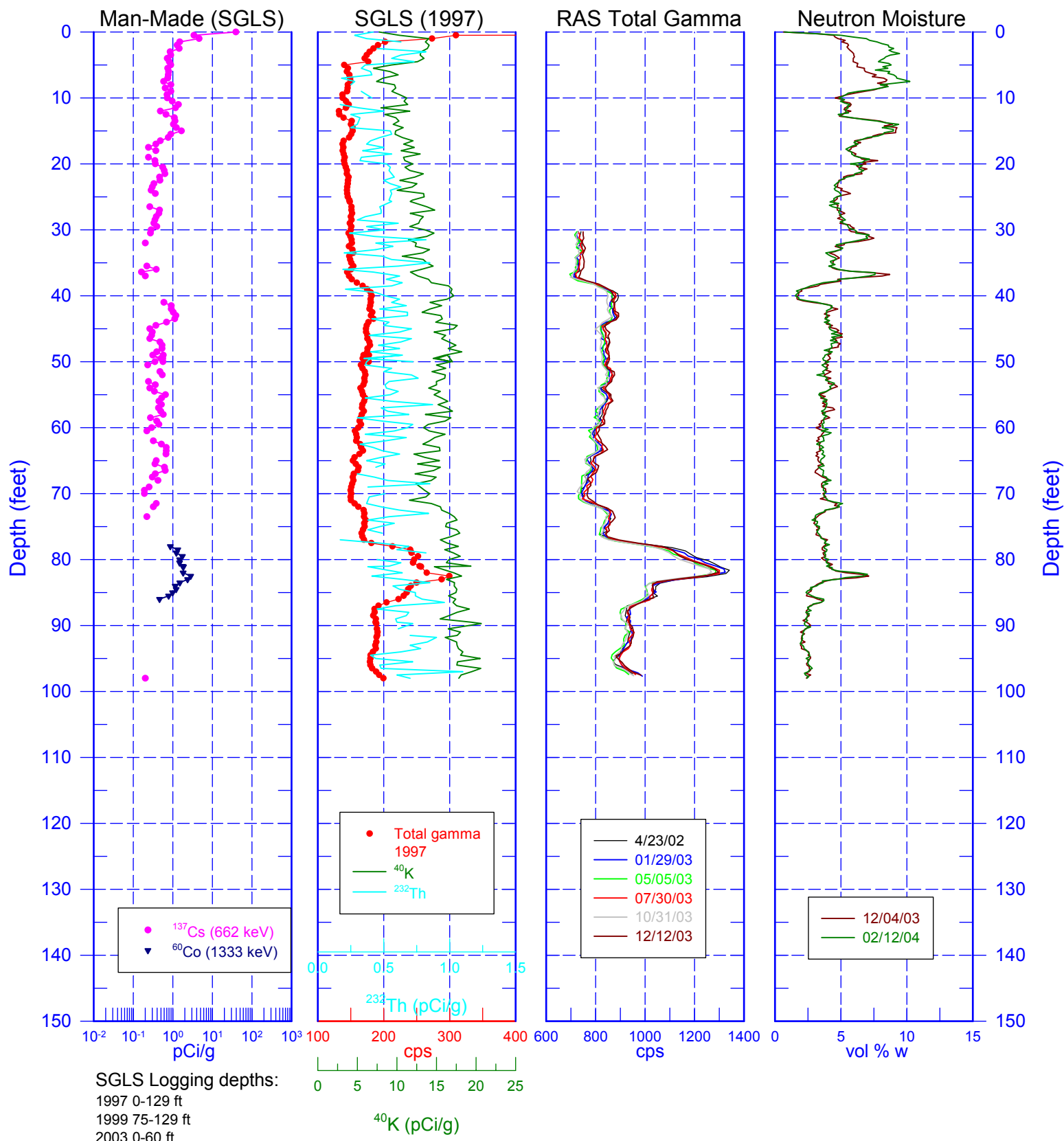
Tank C-106

30-06-09



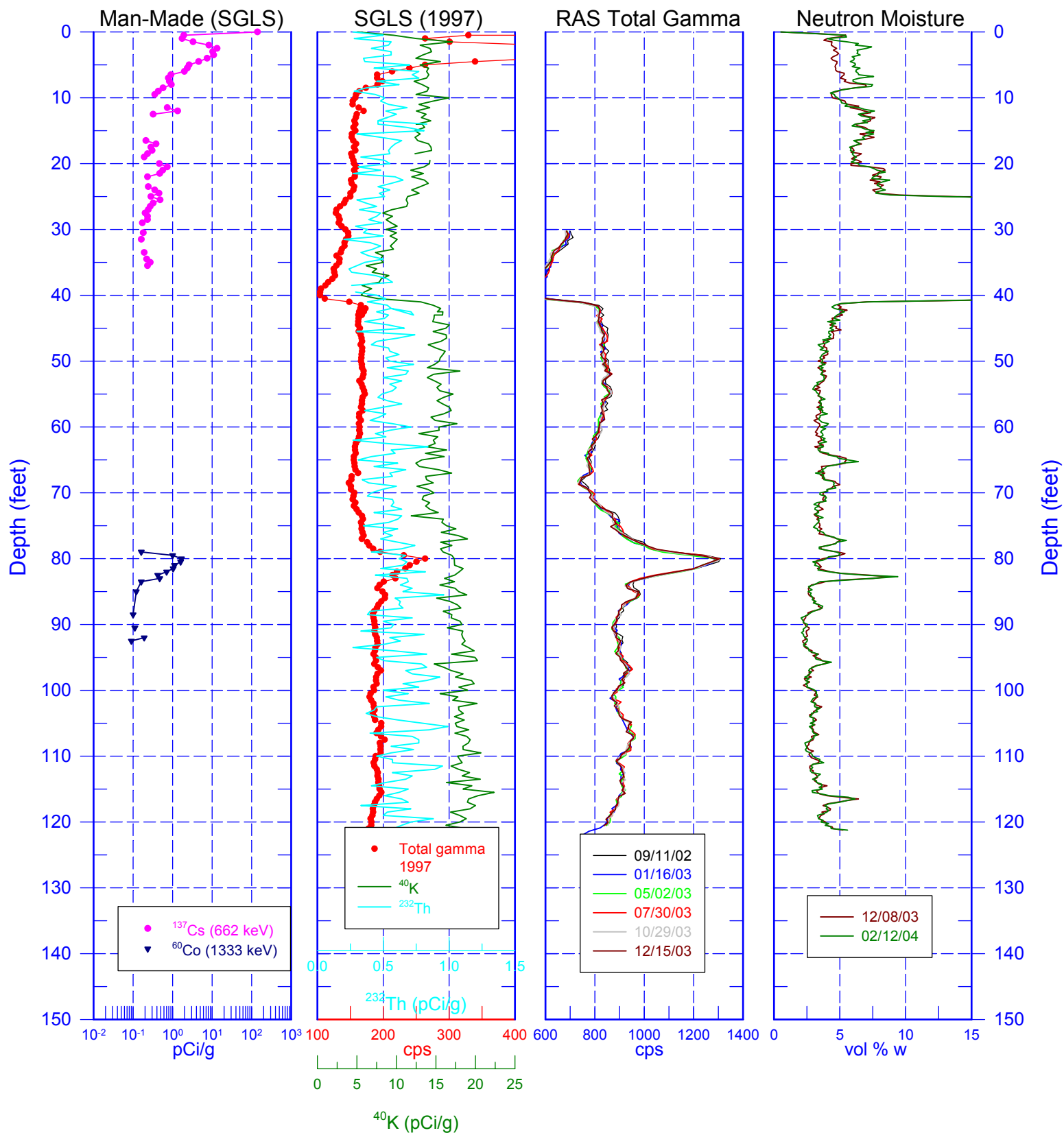
Tank C-106

30-09-06



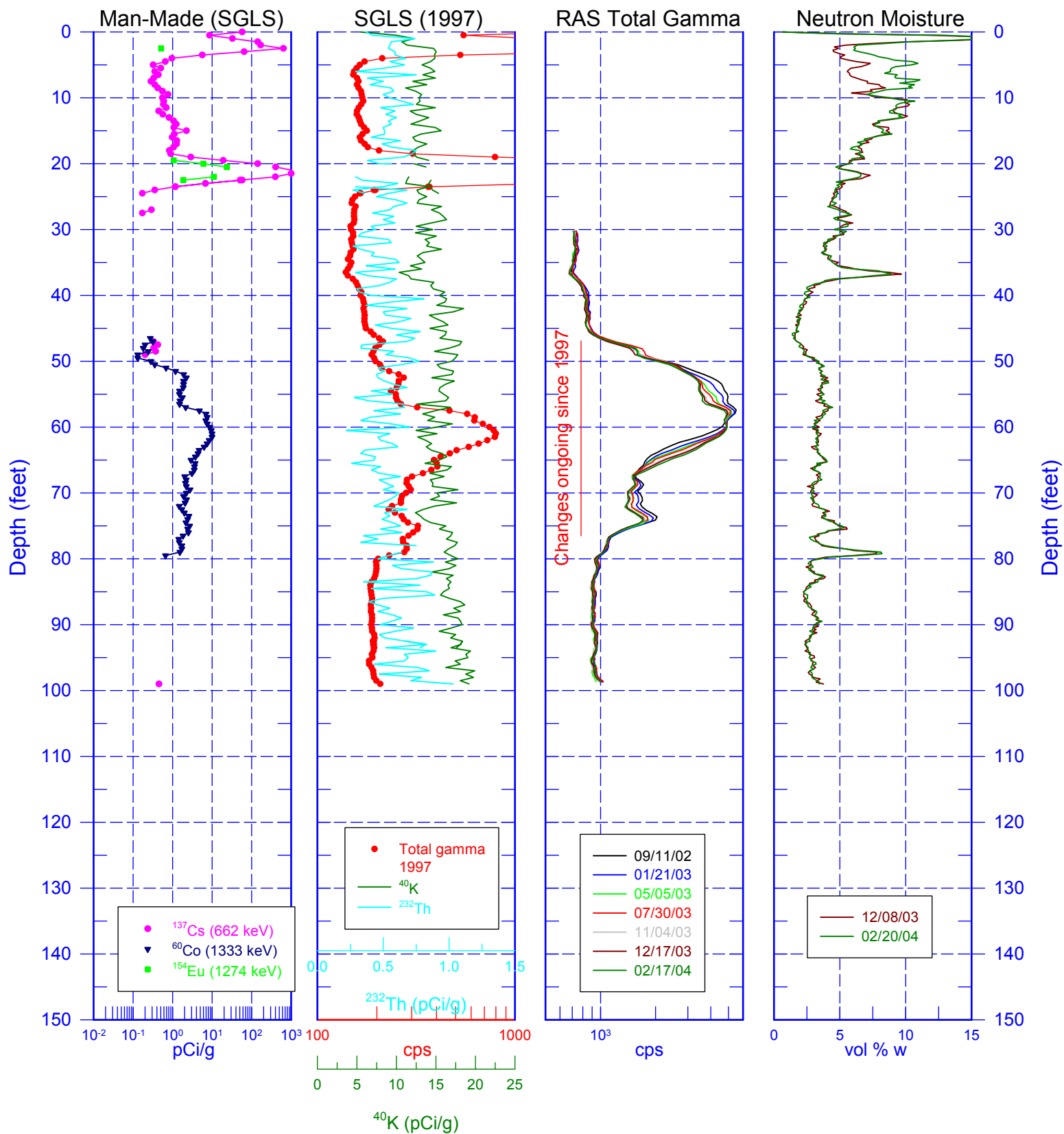
Tank C-106

30-09-07



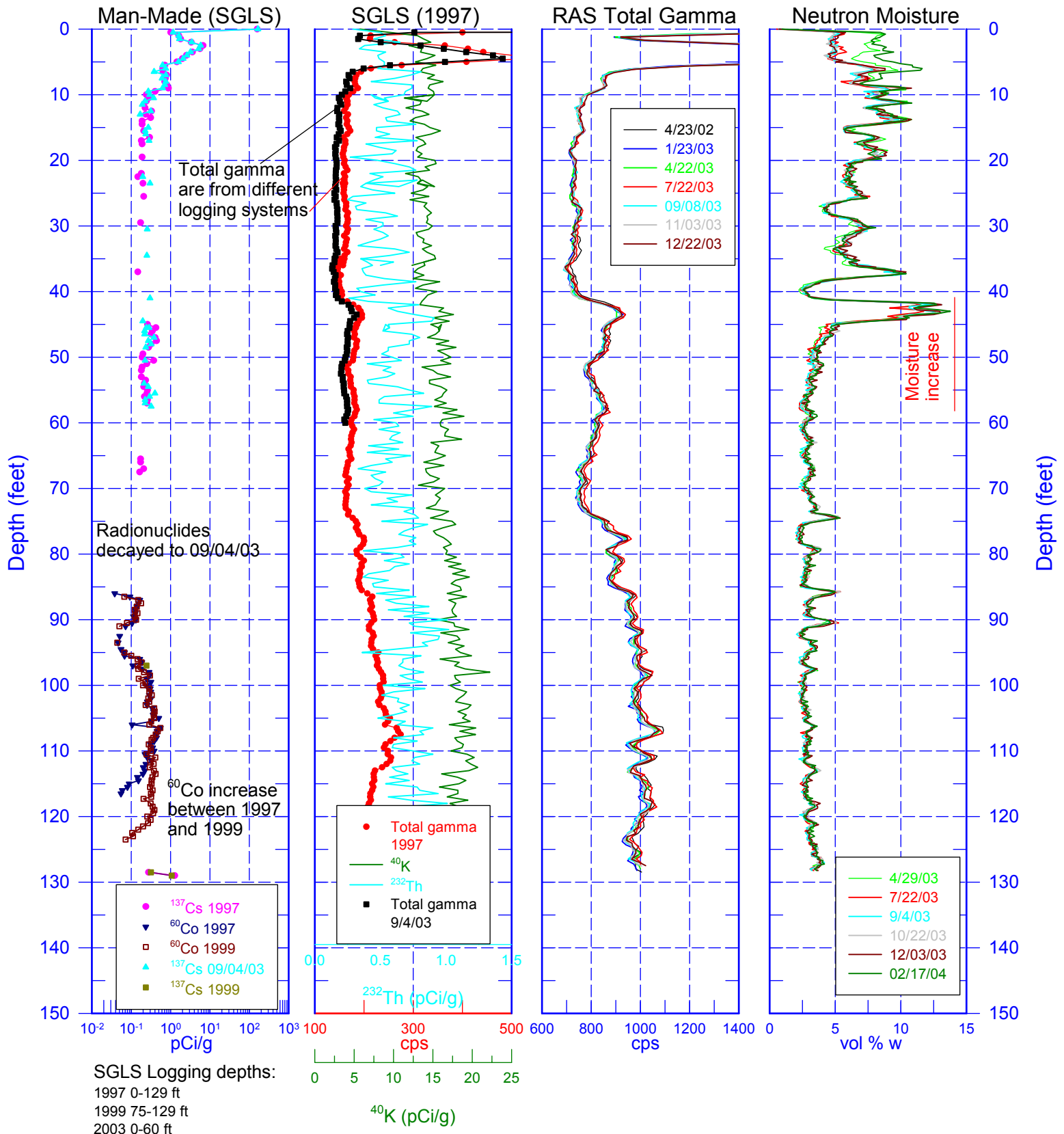
Tank C-108

30-08-02



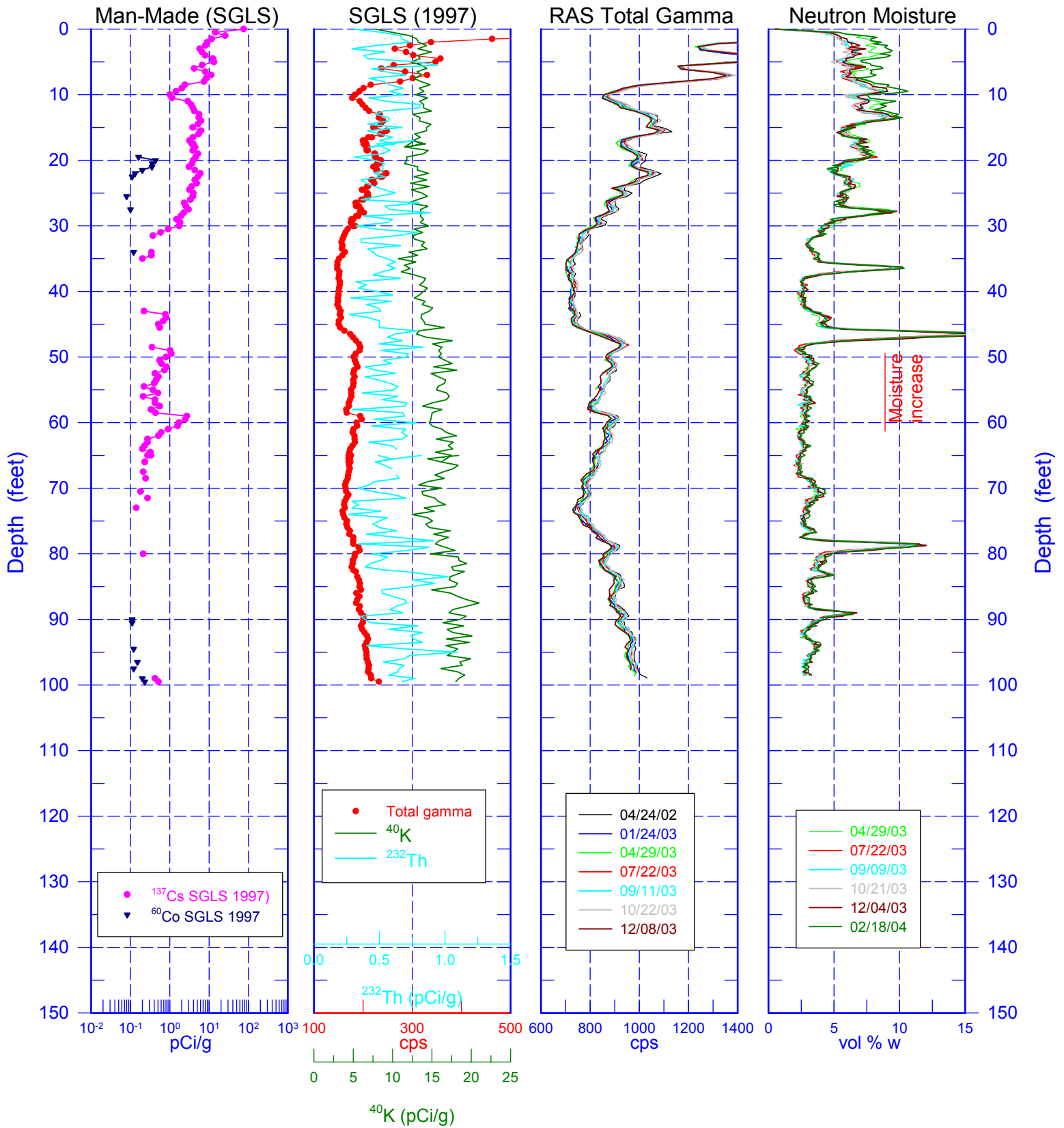
Tank C-106

30-06-10

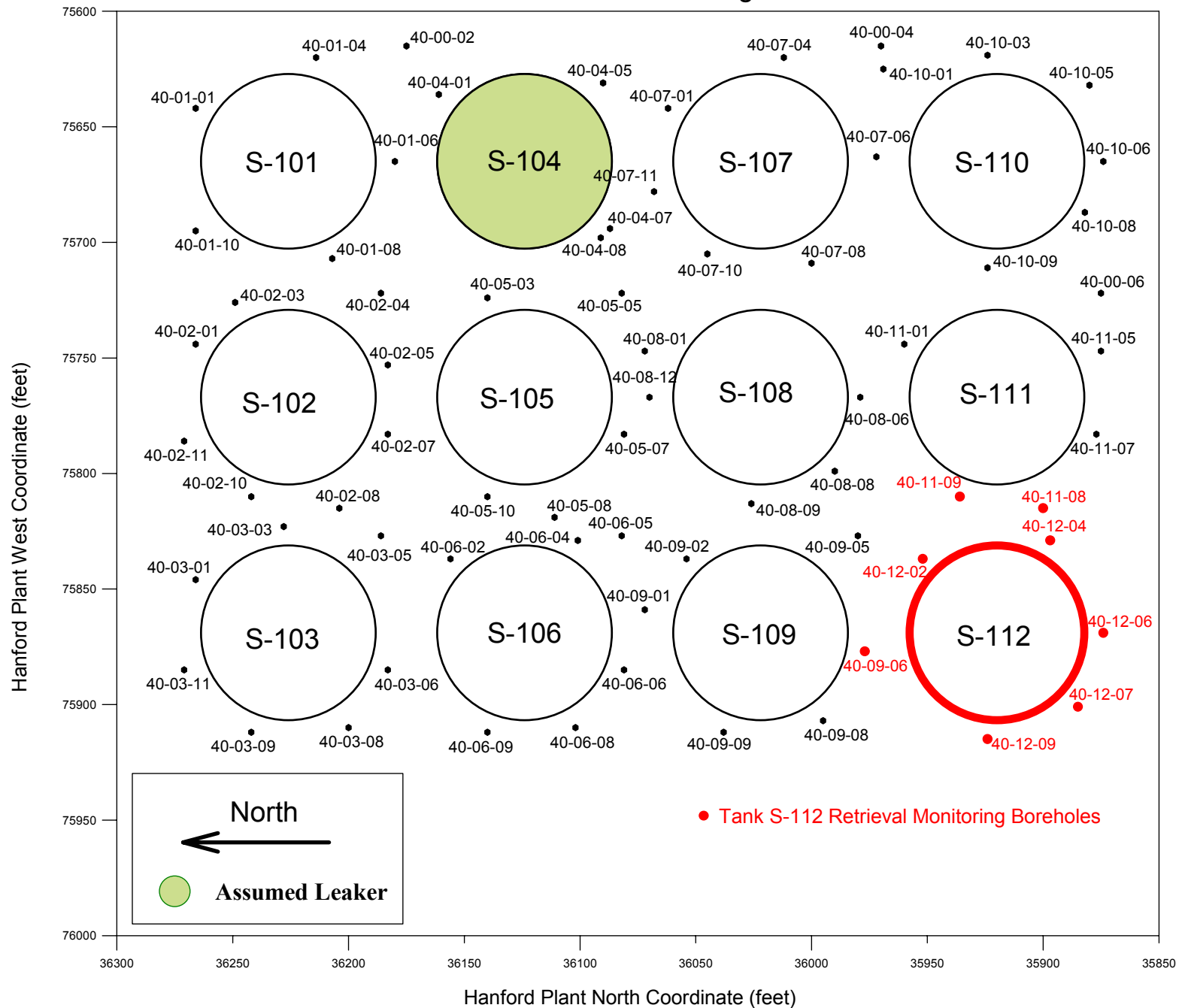


Tank C-106

30-06-12

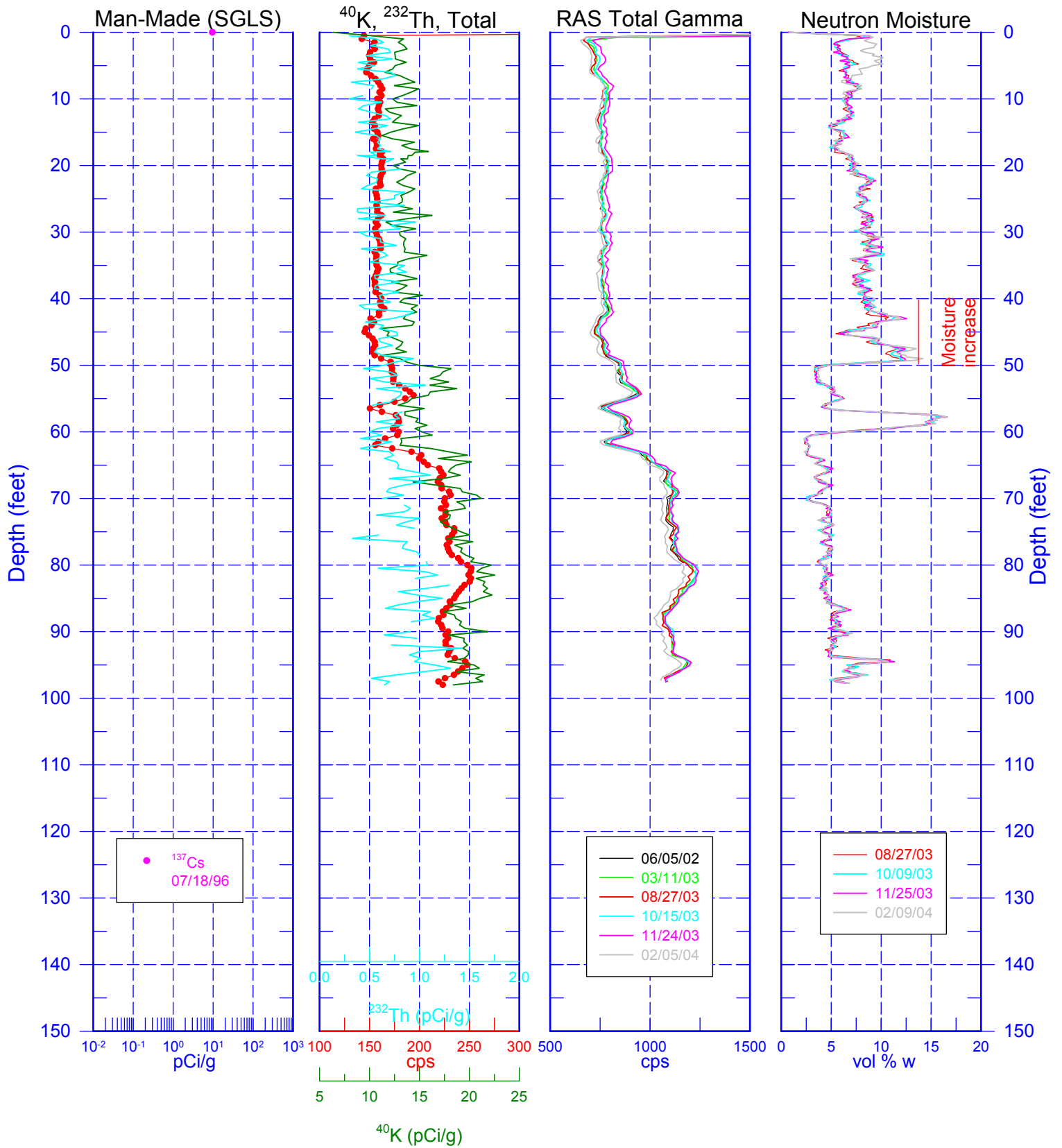


Plan View of the S Tank Farm Showing Borehole Locations



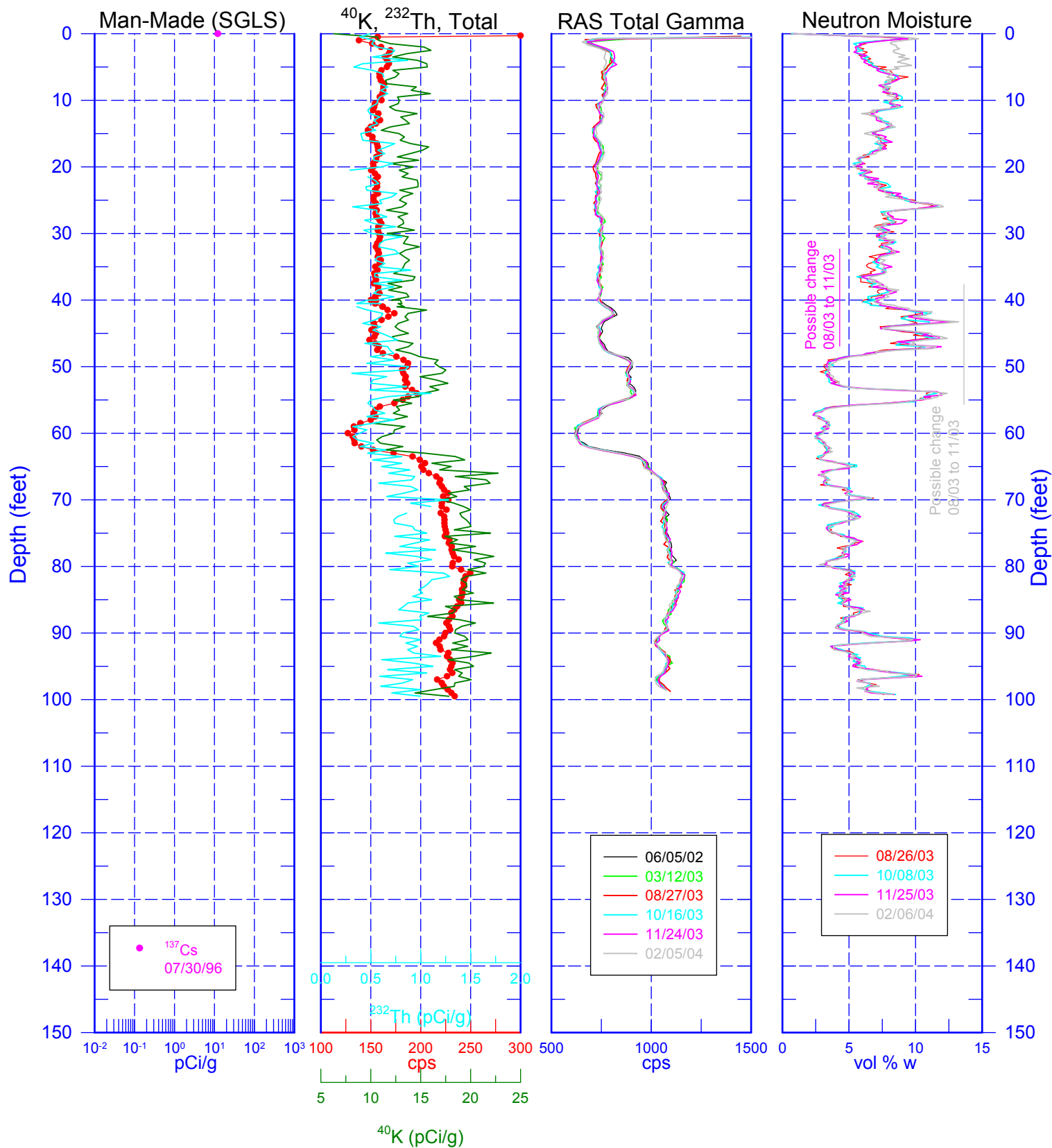
Tank S-109

40-09-06



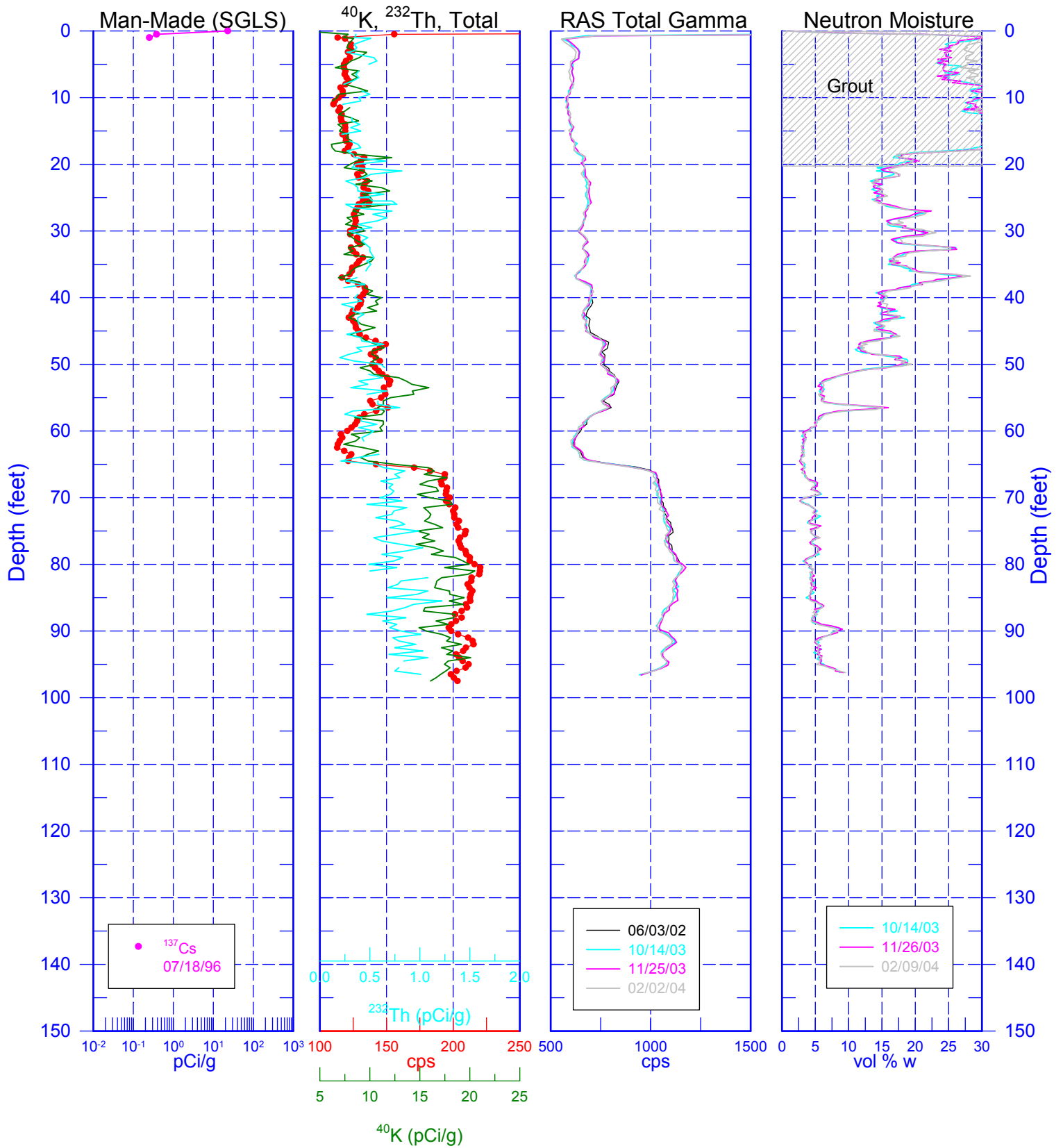
Tank S-112

40-12-02



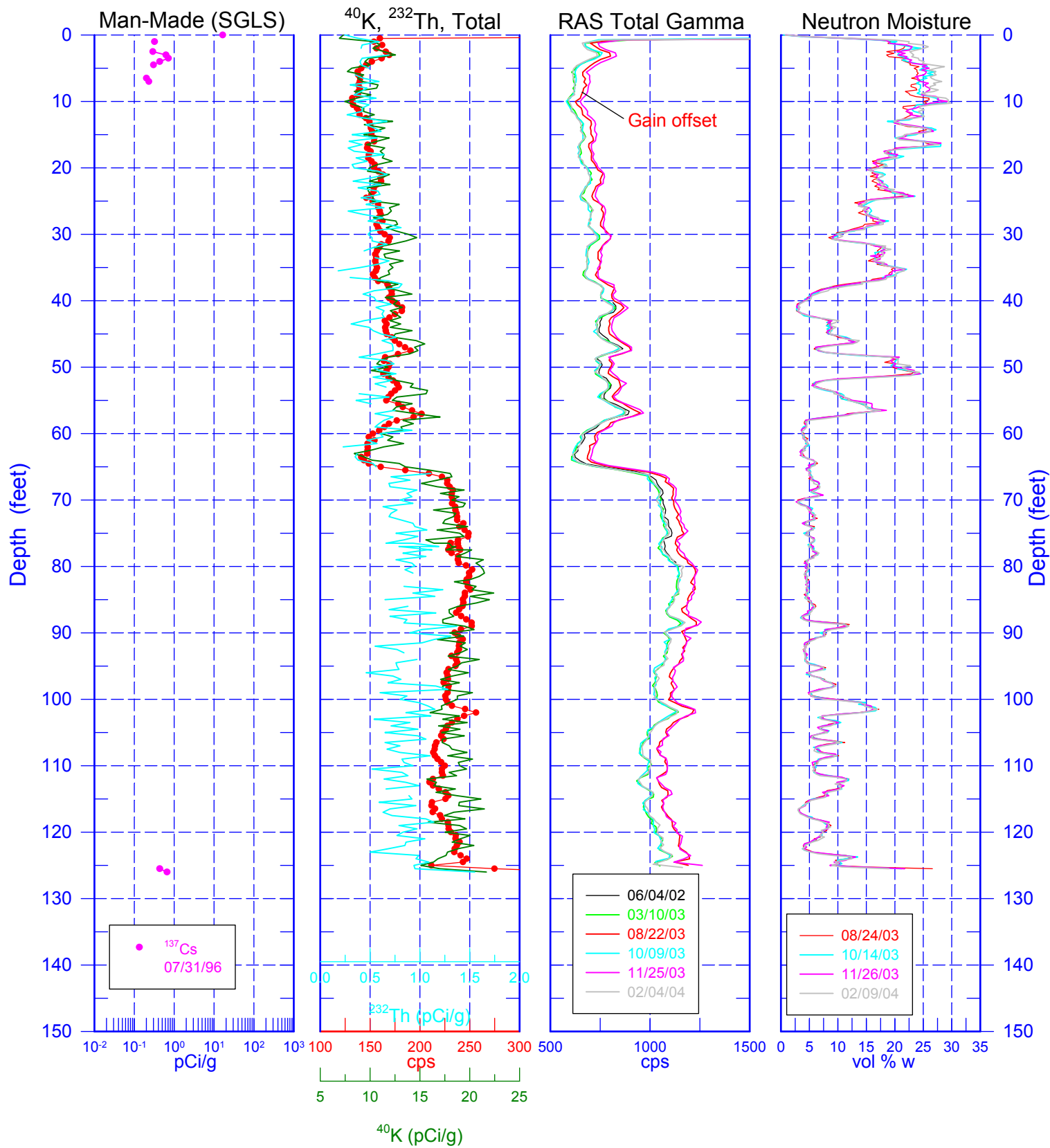
Tank S-111

40-11-08



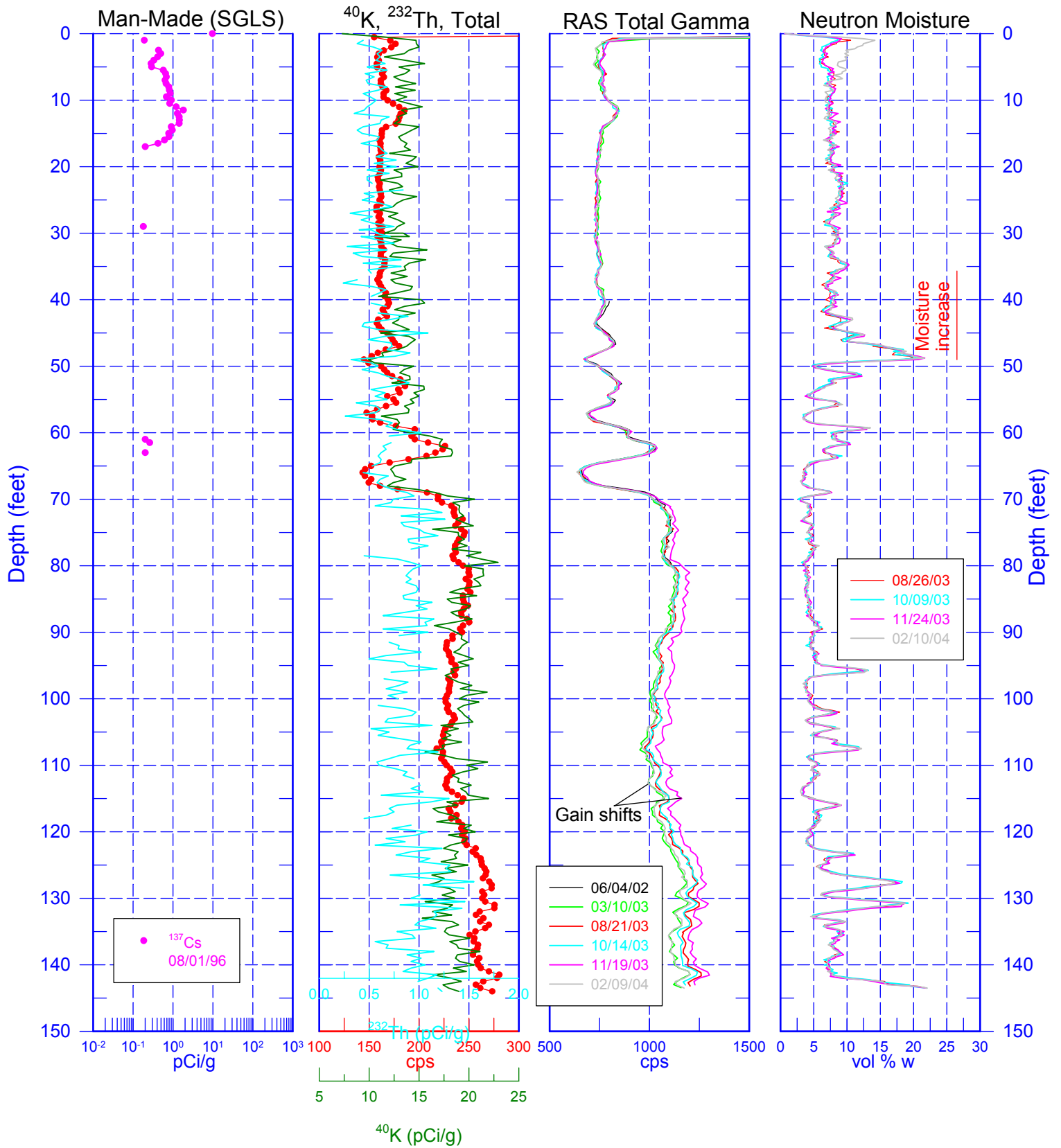
Tank S-112

40-12-04



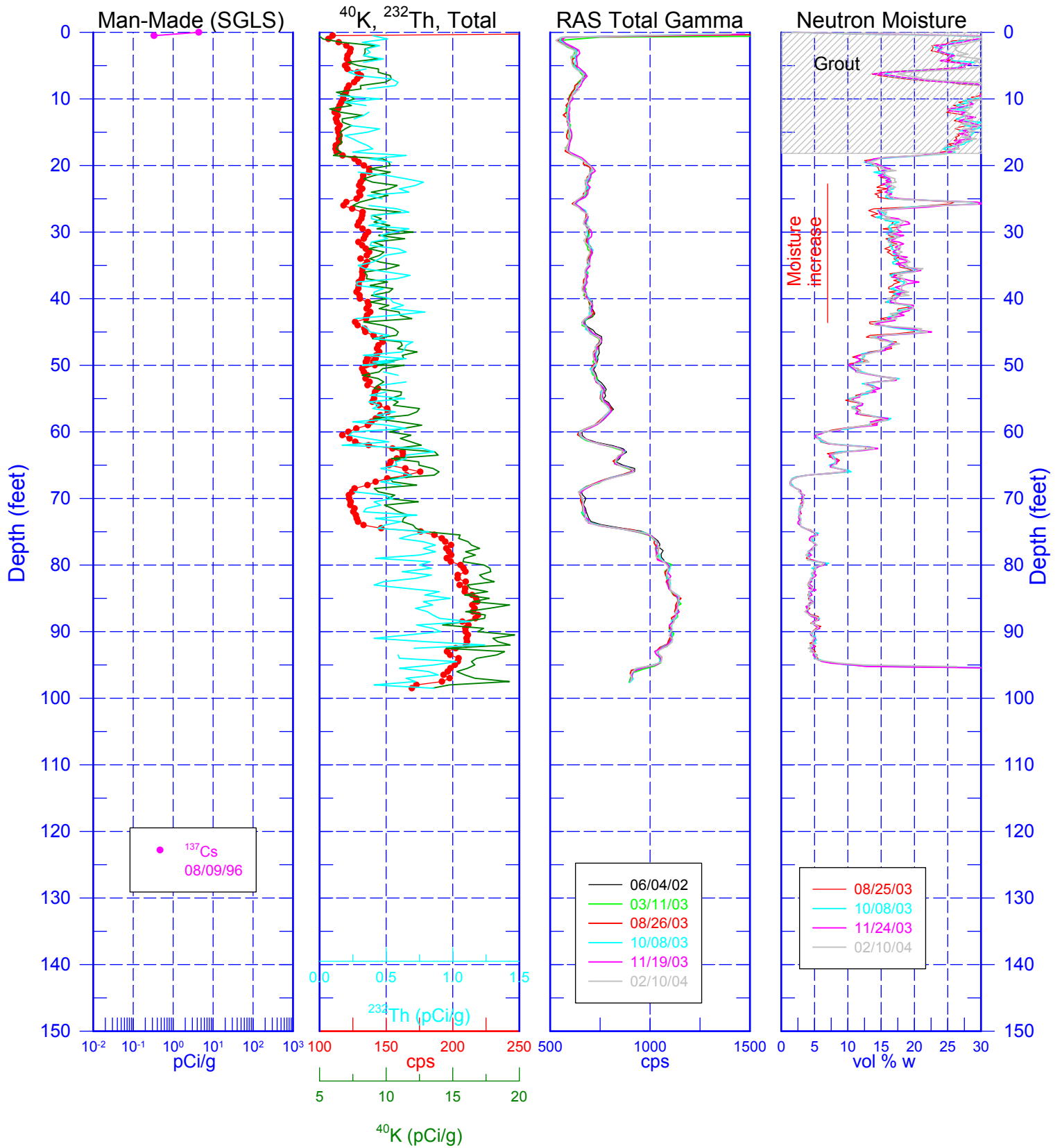
Tank S-112

40-12-06



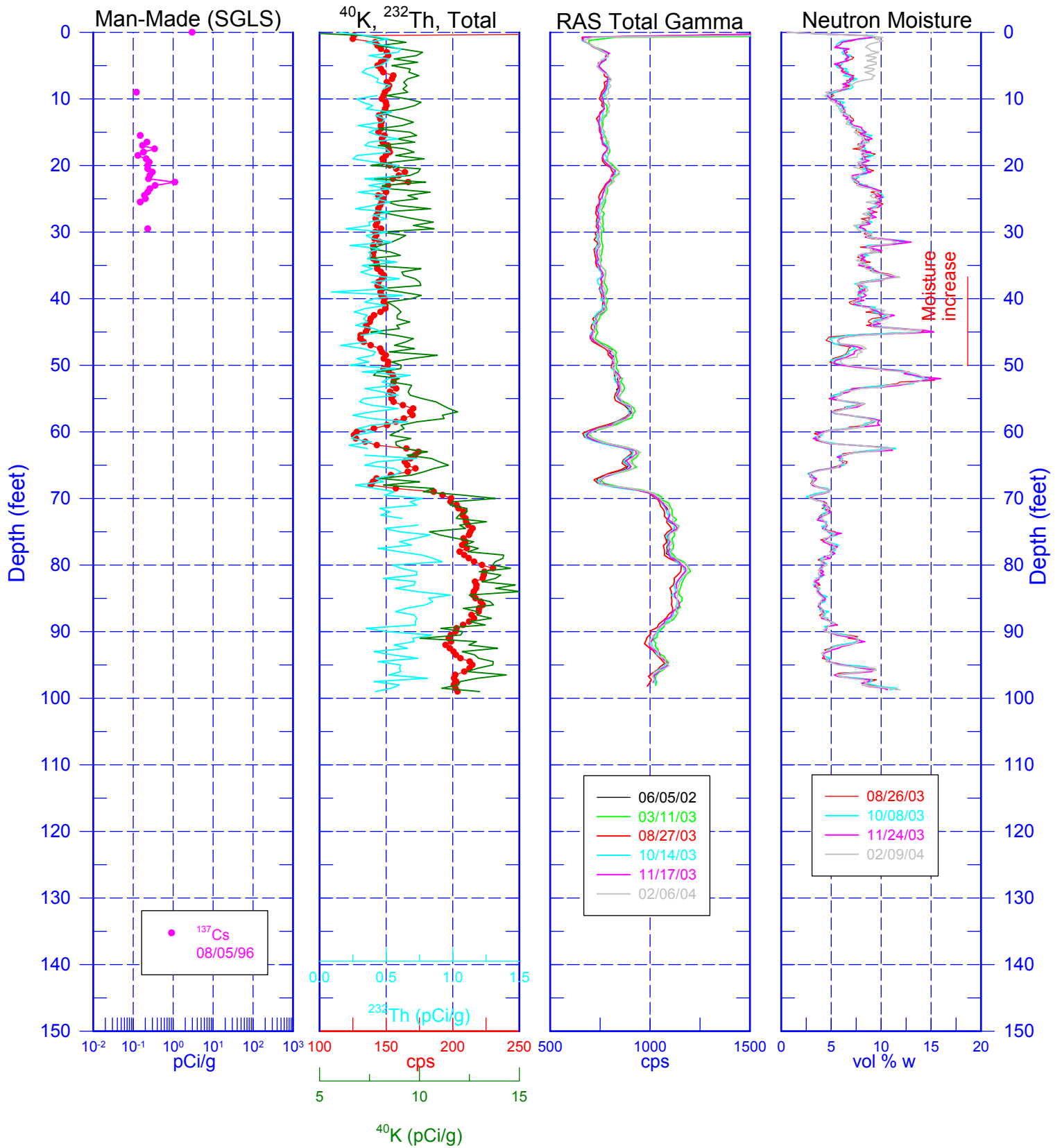
Tank S-112

40-12-07



Tank S-112

40-12-09



Appendix D
Boreholes Projected for Monitoring
During the Second Quarter of FY 2004

Table D-1. Boreholes Projected for Routine Monitoring During the 2nd Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Total Score	Frequency (days)	Next Event Date	Days Past Due	Last Event	Total Events (to date)	Comment
40-04-08	S-104	20	50	30	52	360	05/19/97	2451	05/24/96	1	Borehole obstruction
30-03-03	C-103	30	98	68	51	360	04/06/98	2129	04/11/97	1	Water in borehole 10/01 - Cannot log
30-03-01	C-103	30	125	95	51	360	04/12/98	2123	04/17/97	1	Cannot log because of stairwell; 10/01 and 09/02
41-09-04	SX-109	40	102	62	58	180	03/08/00	1427	09/10/99	1	Not logged due to bh contamination
50-07-07	T-107	30	70	40	42	360	04/07/00	1397	04/13/99	1	No log - water filled (06/18/01)
30-05-06	C-105	0	57	57	3	1800	12/27/01	855	01/22/97	1	No apparent change
30-05-09	C-105	30	90	60	3	1800	12/29/01	853	01/24/97	1	No apparent change
30-04-05	C-104	30	98	68	9	1800	01/11/02	753	02/06/97	1	BE - Cs-137
30-04-04	C-104	30	98	68	9	1800	01/16/02	748	02/11/97	1	BE - Cs-137
41-07-08	SX-107	40	76	46	56	180	03/16/02	689	09/17/01	2	Vent pipe obstruction FY 02
21-07-06	BX-107	20	102	0	36	360	05/15/03	264	05/20/02	2	No apparent change
21-02-04	BX-102	0	230	0	94	360	06/22/03	226	06/27/02	2	No apparent change; HRLS 6/27/02
22-03-05	BY-103	20	99	83	50	360	07/11/03	207	07/16/02	2	No apparent change
51-05-05	TX-105	40	98	58	64	180	07/12/03	206	01/13/03	3	No apparent change
51-03-09	TX-103	40	97	57	55	180	07/13/03	205	01/14/03	3	No apparent change
51-04-05	TX-104	40	97	57	54	180	07/13/03	205	01/14/03	3	No apparent change
51-05-07	TX-105	40	106	66	64	180	07/13/03	205	01/14/03	3	No apparent change
50-01-04	T-101	20	123	103	36	360	07/19/03	199	07/24/02	2	No apparent change; requires HRLS
50-06-05	T-106	30	116	86	130	360	07/21/03	197	07/26/02	2	No apparent change; requires HRLS
50-06-04	T-106	55	93	68	117	360	07/24/03	194	07/29/02	2	No apparent change
50-06-06	T-106	65	120	95	130	360	07/24/03	194	07/29/02	2	No apparent change
50-06-08	T-106	46	120	109	130	360	07/24/03	194	07/29/02	2	No apparent change
50-06-17	T-106	30	87	57	117	360	07/25/03	193	07/30/02	2	No apparent change; requires HRLS
50-06-11	T-106	30	83	53	117	360	08/22/03	165	08/27/02	3	No apparent change
50-01-06	T-101	30	87	57	48	360	08/23/03	164	08/28/02	3	No apparent change
50-01-12	T-101	30	70	40	36	360	08/23/03	164	08/28/02	3	No apparent change
50-05-11	T-105	30	120	90	39	360	08/23/03	164	08/28/02	3	No apparent change
50-00-10	T-106	30	70	40	92	360	08/24/03	163	08/29/02	3	No apparent change
50-06-16	T-106	30	86	61	130	360	08/29/03	158	09/03/02	3	No apparent change

Table D-1. Boreholes Projected for Routine Monitoring During the 2nd Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Total Score	Frequency (days)	Next Event Date	Days Past Due	Last Event	Total Events (to date)	Comment
51-14-08	TX-114	40	85	45	34	360	09/07/03	149	09/12/02	2	No apparent change
51-14-11	TX-114	40	99	59	34	360	09/07/03	149	09/12/02	2	No apparent change
51-16-04	TX-116	35	80	45	38	360	09/07/03	149	09/12/02	2	No apparent change
51-14-04	TX-114	40	97	62	34	360	09/11/03	145	09/16/02	2	No apparent change
20-10-12	B-110	102	120	18	37	360	09/14/03	142	09/19/02	2	No apparent change
20-02-09	B-105	35	99	64	34	360	09/18/03	138	09/23/02	2	No apparent change
20-03-06	B-103	35	75	40	34	360	09/18/03	138	09/23/02	2	No apparent change
20-12-06	B-111	35	75	40	35	360	09/18/03	138	09/23/02	2	No apparent change
20-05-06	B-105	35	120	86	34	360	09/20/03	136	09/25/02	2	No apparent change
20-11-09	B-111	35	75	40	35	360	09/20/03	136	09/25/02	2	No apparent change
11-01-09	AX-101	45	85	40	66	360	09/21/03	135	09/26/02	2	No apparent change
22-07-02	BY-107	30	100	70	68	180	09/30/03	126	04/03/03	4	Apparent change 98-100 ft not confirmed
22-07-05	BY-107	30	97	67	68	180	09/30/03	126	04/03/03	4	Apparent change 75-81 ft not confirmed
22-07-07	BY-107	40	99	59	68	180	09/30/03	126	04/03/03	4	No apparent change
22-10-07	BY-110	40	90	50	53	180	09/30/03	126	04/03/03	4	No apparent change
22-08-02	BY-108	25	102	77	74	180	10/01/03	125	04/04/03	4	No apparent change
22-08-05	BY-108	35	98	63	74	180	10/01/03	125	04/04/03	5	Apparent change 75-82 ft not confirmed
22-08-12	BY-108	30	100	70	74	180	10/01/03	125	04/04/03	4	No apparent change
10-01-06	A-101	45	85	40	89	360	10/02/03	124	10/07/02	3	No apparent change
10-01-08	A-101	45	85	40	89	360	10/02/03	124	10/07/02	3	No apparent change
10-01-09	A-101	45	63	18	89	360	10/02/03	124	10/07/02	3	No apparent change
10-01-10	A-101	45	85	40	89	360	10/02/03	124	10/07/02	3	No apparent change
10-01-11	A-101	45	85	40	89	360	10/02/03	124	10/07/02	3	No apparent change
10-03-07	A-103	45	123	78	43	360	10/03/03	123	10/08/02	2	No apparent change
10-01-05	A-101	45	85	40	89	360	10/04/03	122	10/09/02	3	No apparent change
11-01-05	AX-101	45	85	40	66	360	10/04/03	122	10/09/02	2	No apparent change
22-06-05	BY-106	20	97	77	76	180	10/04/03	122	04/07/03	4	No apparent change
10-00-07	A-101	45	85	40	89	360	10/05/03	121	10/10/02	3	No apparent change
10-00-08	A-101	45	85	40	89	360	10/05/03	121	10/10/02	3	No apparent change

Table D-1. Boreholes Projected for Routine Monitoring During the 2nd Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Total Score	Frequency (days)	Next Event Date	Days Past Due	Last Event	Total Events (to date)	Comment
60-11-07	U-111	35	123	88	37	360	11/07/03	88	11/12/02	3	No apparent change
60-11-12	U-111	35	124	89	37	360	11/07/03	88	11/12/02	3	No apparent change
50-01-09	T-101	30	90	60	61	180	11/11/03	84	05/15/03	6	Apparent change at 86-90 ft not confirmed
50-04-08	T-104	30	95	65	55	180	11/11/03	84	05/15/03	5	No apparent change
50-04-10	T-104	30	87	57	55	180	11/11/03	84	05/15/03	6	Apparent change 67-68 ft
22-08-06	BY-108	40	98	58	61	360	11/14/03	81	11/19/02	3	No apparent change
22-10-05	BY-110	40	98	58	41	360	11/14/03	81	11/19/02	3	No apparent change
22-07-01	BY-107	40	98	58	43	360	11/15/03	80	11/20/02	3	No apparent change
22-08-01	BY-108	25	99	74	61	360	11/15/03	80	11/20/02	3	No apparent change
22-08-07	BY-108	40	110	70	49	360	11/15/03	80	11/20/02	3	No apparent change
50-02-05	T-102	30	83	53	55	180	11/15/03	80	05/19/03	5	Apparent Cs-137 increase (39-41ft)
50-09-10	T-109	30	119	89	54	180	11/16/03	79	05/20/03	6	Apparent change at 76 and 94 ft not confirmed
50-00-09	T-106	30	120	90	142	180	11/17/03	78	05/21/03	5	No apparent change
52-03-06	TY-103	40	100	60	56	180	11/18/03	77	05/22/03	6	Definite change 55-60 ft; report issued 5/14/02
22-06-07	BY-106	35	131	96	64	360	11/22/03	73	11/27/02	3	No apparent change
52-06-05	TY-106	40	147	107	66	180	11/23/03	72	05/27/03	4	Pos change 130-148 ft, ongoing 12/04/03, 5/27/03
52-05-07	TY-105	40	96	56	82	180	11/24/03	71	05/28/03	4	No apparent change
22-07-09	BY-107	20	99	84	55	360	11/28/03	67	12/03/02	3	No apparent change
50-09-01	T-109	30	86	56	54	180	12/13/03	52	06/16/03	6	Apparent change at 85 ft result of water level
50-09-02	T-109	30	86	56	54	180	12/13/03	52	06/16/03	4	App change 81-86 ft caused by diff. D/W
50-06-02	T-106	30	122	92	142	180	12/14/03	51	06/17/03	6	Apparent change at 110 ft not confirmed
50-06-03	T-106	30	118	88	142	180	12/14/03	51	06/17/03	6	Apparent change at 115 ft not confirmed
50-06-18	T-106	25	130	110	142	180	12/15/03	50	06/18/03	6	Poss. Incr. 117-119 ft (Co-60), poss. ongoing 6/18/03
41-00-08	SX-109	40	90	50	58	180	01/07/04	27	07/11/03	6	No apparent change
30-04-03	C-104	20	49	32	34	360	01/10/04	24	01/15/03	2	No apparent change
41-02-02	SX-102	25	139	114	82	180	01/12/04	22	07/16/03	6	Possible change not confirmed; possible Sr-90
30-04-02	C-104	30	134	104	34	360	01/23/04	11	01/28/03	2	No apparent change
41-03-02	SX-103	30	80	50	45	360	01/31/04	3	02/05/03	3	No apparent change
41-03-05	SX-103	40	80	40	45	360	02/01/04	2	02/06/03	3	No apparent change

Table D-1. Boreholes Projected for Routine Monitoring During the 2nd Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Total Score	Frequency (days)	Next Event Date	Days Past Due	Last Event	Total Events (to date)	Comment
41-10-01	SX-110	40	80	40	54	180	02/01/04	2	08/05/03	5	Possible ongoing Cs-137 increase at 66 ft
41-11-10	SX-111	40	95	69	54	180	02/02/04	1	08/06/03	5	No apparent change; HRLS 04/18/02
41-09-07	SX-109	40	73	35	58	180	02/03/04	0	08/07/03	5	No apparent change; HRLS 04/22/02
41-09-03	SX-109	40	74	31	46	180	02/04/04	-1	08/08/03	3	No apparent change; HRLS 04/22/02
41-09-09	SX-109	40	95	66	58	180	02/04/04	-1	08/08/03	5	No apparent change
41-14-06	SX-114	30	76	46	40	360	02/06/04	-3	02/11/03	3	No apparent change
41-14-09	SX-114	40	75	35	40	360	02/06/04	-3	02/11/03	3	No apparent change
41-14-11	SX-114	40	75	35	40	360	02/06/04	-3	02/11/03	3	No apparent change
41-15-07	SX-115	40	90	50	65	360	02/07/04	-4	02/12/03	3	Apparent Cs-137 increase (57-60ft)
41-07-07	SX-107	40	74	25	56	180	02/08/04	-5	08/12/03	5	No apparent change; HRLS 04/19/02
41-12-03	SX-112	40	75	40	63	360	02/08/04	-5	02/13/03	3	No apparent change
60-05-04	U-105	35	72	37	44	180	02/09/04	-6	08/13/03	7	No apparent change
60-07-01	U-107	0	98	98	85	180	02/09/04	-6	08/13/03	9	App change 83-88 ft not confirmed
60-04-08	U-104	40	118	78	94	180	02/10/04	-7	08/14/03	9	App change (74-78 and 84-89 ft) not confirmed
60-05-05	U-105	35	123	88	44	180	02/11/04	-8	08/15/03	6	Possible increase 75-80 ft
21-02-03	BX-102	35	98	63	106	180	03/21/04	-47	09/23/03	6	No apparent change
21-27-08	BX-102	35	148	113	106	180	03/22/04	-48	09/24/03	6	Apparent change 137.5-148.5 ft not confirmed
21-27-11	BX-102	30	136	106	106	180	03/23/04	-49	09/25/03	6	No apparent change
21-27-01	BX-102	35	98	63	106	180	03/27/04	-53	09/29/03	6	No apparent change
21-03-03	BX-103	35	90	55	55	180	03/29/04	-55	10/01/03	6	No apparent change

Table D-2. Boreholes Projected for Retrieval Monitoring During the 2nd Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Next Event Date	Last Event Date	Total Events (to date)	Comment
30-00-01	C-106	0	65	65	01/01/04	12/02/03	7	No apparent change, C-106 Retrieval
30-05-02	C-105	5	127	122	01/14/04	12/15/03	7	No apparent change, C-106 Retrieval
30-06-02	C-106	0	122	122	11/20/03	10/21/03	5	No apparent change, C-106 Retrieval
30-06-03	C-106	0	98	98	01/01/04	12/02/03	6	No apparent change, C-106 Retrieval
30-06-04	C-106	0	129	129	01/21/04	12/22/03	7	No apparent change, C-106 Retrieval
30-06-09	C-106	5	98	93	01/11/04	12/12/03	7	No apparent change, C-106 Retrieval
30-06-10	C-106	0	128	128	01/21/04	12/22/03	7	Possible change 124-126 ft Co-60, C-106 Retrieval
30-06-12	C-106	0	98	98	01/07/04	12/08/03	7	No apparent change, C-106 Retrieval
30-08-02	C-108	30	99	69	01/16/04	12/17/03	7	Definite change in Co-60 49-75 ft, downward movement
30-09-06	C-109	30	98	68	01/11/04	12/12/03	6	No apparent change
30-09-07	C-109	30	121	91	01/14/04	12/15/03	6	No apparent change
40-02-01	S-102	0	129	129	08/01/03	07/02/03	2	No apparent change, S-102 Retrieval
40-02-03	S-102	0	98	98	08/07/03	07/08/03	1	Apparent Cs-137 increase at 44-47 ft., S-102 Retrieval
40-02-04	S-102	0	144	144	08/08/03	07/09/03	2	No apparent change, S-102 Retrieval
40-02-05	S-102	0	97	97	08/06/03	07/07/03	2	No apparent change, S-102 Retrieval
40-02-07	S-102	0	95	95	08/06/03	07/07/03	2	No apparent change, S-102 Retrieval
40-02-08	S-102	0	99	99	08/06/03	07/07/03	2	No apparent change, S-102 Retrieval
40-02-10	S-102	0	100	100	07/31/03	07/01/03	2	No apparent change, S-102 Retrieval
40-02-11	S-102	0	100	100	08/01/03	07/02/03	2	No apparent change, S-102 Retrieval
40-09-06	S-109	0	98	98	12/24/03	11/24/03	5	No apparent change; S-112 Retrieval
40-11-08	S-111	0	97	97	12/25/03	11/25/03	3	No apparent change, S-112 Retrieval
40-11-09	S-111	0	98	98	12/31/03	12/01/03	4	No apparent change, S-112 Retrieval
40-12-02	S-112	0	99	99	12/24/03	11/24/03	5	No apparent change; S-112 Retrieval
40-12-04	S-112	0	126	126	12/25/03	11/25/03	5	No apparent change; S-112 Retrieval
40-12-06	S-112	0	144	144	12/19/03	11/19/03	5	No apparent change; S-112 Retrieval
40-12-07	S-112	0	98	98	12/19/03	11/19/03	5	No apparent change; S-112 Retrieval
40-12-09	S-112	0	98	98	12/17/03	11/17/03	5	No apparent change; S-112 Retrieval

Table D-3. Boreholes Projected for Retrieval Moisture Logging During the 2nd Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Next Event Date	Last Event Date	Total Events (to date)	Comment
30-05-02	C-105	0	127	127	01/01/04	12/02/03	5	Possible increase 42-70 ft
30-06-02	C-106	0	122	122	01/03/04	12/04/03	5	Possible increase 56-76 ft
30-06-03	C-106	0	98	98	01/03/04	12/04/03	5	Possible increase 57-68 ft
30-06-04	C-106	0	129	129	01/09/04	12/10/03	5	Possible increase 45-53 ft
30-06-09	C-106	0	98	98	01/01/04	12/02/03	5	Possible increase 50-72 ft
30-06-10	C-106	0	128	128	01/02/04	12/03/03	5	Possible increase 42-58 ft
30-06-12	C-106	0	98	98	01/03/04	12/04/03	5	Possible increase 50-60 ft
30-08-02	C-108	0	99	99	01/08/04	12/09/03	1	Only one event, no comparison
30-09-06	C-109	0	98	98	01/07/04	12/08/03	1	Only one event, no comparison
30-09-07	C-109	0	121	121	01/07/04	12/08/03	1	Only one event, no comparison
40-02-01	S-102	0	129	129	TBD	NA	0	No moisture logging performed to date.
40-02-03	S-102	0	98	98	TBD	NA	0	No moisture logging performed to date.
40-02-04	S-102	0	144	144	TBD	NA	0	No moisture logging performed to date.
40-02-05	S-102	0	97	97	TBD	NA	0	No moisture logging performed to date.
40-02-07	S-102	0	95	95	TBD	NA	0	No moisture logging performed to date.
40-02-08	S-102	0	99	99	TBD	NA	0	No moisture logging performed to date.
40-02-10	S-102	0	100	100	TBD	NA	0	No moisture logging performed to date.
40-02-11	S-102	0	100	100	TBD	NA	0	No moisture logging performed to date.
40-09-06	S-109	0	98	98	12/25/03	11/25/03	3	Possible increase 40-50 ft
40-11-08	S-111	0	96	96	12/26/03	11/26/03	2	None
40-11-09	S-111	0	98	98	12/25/03	11/25/03	2	Possible increase 23-33 ft
40-12-02	S-112	0	99	99	12/25/03	11/25/03	3	Possible increase 32-47 ft
40-12-04	S-112	0	126	126	12/26/03	11/26/03	3	Possible increase 53-55 ft
40-12-06	S-112	0	144	144	12/24/03	11/24/03	3	Possible increase 35-49 ft
40-12-07	S-112	0	96	96	12/24/03	11/24/03	3	Possible increase 23-43 ft
40-12-09	S-112	0	99	99	12/24/03	11/24/03	3	Possible increase 37-50 ft